START

Final

Meeting Minutes Transmittal/Approval
Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
740 Stevens Center, Room 1200, Richland, Washington
June 23, 1993

FROM/APPROVAL: Eric Goller Date 7/28/93
Eric D. Goller, 100 Area Unit Manager, RL (A5-19)

APPROVAL: Ted A Wooley for Date 7/28/93
Jack W. Donnelly, 100 Aggregate Area Unit Manager, WA Department of Ecology

APPROVAL: Larry Gadbois for Date July 28 '93
Dennis Faulk, 100 Aggregate Area Unit Manager, EPA (B5-01)

Meeting Minutes are attached. Minutes are comprised of the following:

Attachment #1	-	Meeting Summary
Attachment #2	-	Attendance Sheet
Attachment #3	-	Agenda
Attachment #4	-	Action Item Status List
Attachment #5	-	Status Package 100 Area Unit Manager's Meeting June 23, 1993
Attachment #6	-	100 Area Qualitative Risk Assessment (QRA) Update June 23, 1993
Attachment #6b	-	Ecological Risk Assessment
Attachment #7	-	100-HR-3 Groundwater Treatability Tests
Attachment #8	-	100 Area Groundwater Treatability Study
Attachment #9	-	222-S Laboratory Complex Entry Requirements
Attachment #10	-	100 NPL Agreement/Change Control Form #51
Attachment #11	-	100 NPL Agreement/Change Control Form #53
Attachment #12	-	100 NPL Agreement/Change Control Form #48
Attachment #13	-	100 NPL Agreement/Change Control Form #55

Prepared by: Suzanne E. Clarke Date: 7/28/93
Suzanne Clarke, Kay Kimmel, GSSC (A4-35)

Concurrence by: A. D. Krug for Date: 7/28/93
Bob Henckel, WHC Coordinator (H6-02)

Attachment #1
Meeting and Summary of Commitments and Agreements

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 23, 1993

1. **SIGNING OF THE MAY 100 AREA UNIT MANAGER'S MEETING MINUTES** - Minutes were reviewed and approved with no changes.

2. **ACTION ITEM UPDATE: (See Attachment 4 for complete status, items listed below indicate the update to Action Items made during the meeting):**

   1AAMS.9 No additional information.

   1AAMS.15 No additional information.

   1AAMS.16 No additional information.

3. **NEW ACTION ITEMS:** No new action items were initiated this month.

4. **100 AREA ACTIVITIES:**

   - Attachment #5 was provided for general information on the 100 Areas Operable Units.

   - Milestone 30-05: Robert E. Peterson presented an update of activities being performed to fulfill the M-30-05 Milestone. He reported that comments were received from the Regulators concerning the NPL Agreement distributed at the May UMM. None of the comments should impede the progress of the work described in the agreement. Instrumentation for continuous monitoring of conductivity measurements has been installed and measurements are ongoing.

   - ORA & LFI Update: Nancy Lane described enhancements to the qualitative risk assessments under preparation for use in 100-Area Operable Units. The enhancements provide additional information concerning risk from radionuclides (see attachment #6).

   - Ecological Risk Assessment Update - Nancy Lane presented Steve Friant's efforts to improve the relevance of the ecological risk assessments (see attachment #6b). S. Friant has yet to incorporate mouse life cycle information, but believes that this information could be very valuable.

   - Treatability Study Status: Jim Field presented the status of the 300 Area soil washing tests. He provided information on work in progress and planned future tests. Pilot tests are still scheduled for Fiscal Year 1993.

   - 100-HR-3 Treatability Study: Jim Duncan presented the status of the groundwater treatability tests (see attachments #7 and #8). A tour of the 222-S Laboratory is in the planning stage (see attachment #9 for entry requirements). Any interested parties should contact J. Duncan or Bob Scheck.

- 100-HR-1 Excavation Treatability Study: Joan Woolard provided NPL Agreement Forms #51 and #53 for inclusion into the minutes (see attachments #10 and #11). She indicated the procedure for the excavation test will be issued in mid-July. Eric Goller noted that a categorical exclusion (for the NEPA process) is on schedule for approval by July 2. Several public comments have been received by the Regulators; however, no comments impact the schedule.

- 100-BC-2: The RI/FS Work Plan is still out for public comment. The public comment period will close on July 7. There is no indication that there will be comments which would impede this work. EPA noted that they are not able to endorse the use of the SW-846 methodology as their internal committee has not made a final determination on its applicability.

- NPL Agreement forms #48 and #55 are provided as attachments #12 and #13, respectively.

100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
June 23, 1993

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
KAY KIMMEL	MACTEC (D&M)	RL SUPPORT	509-376-1985
BOB SCHECK	DAMES+MOORE	RL SUPPORT	946-0176
Eric Goller	RL	100 Area OU Mgr	6-7326
Gary Friedman	Ecology	100 Area OU Mgr	376-3026
CHUCK CLINE	"	Hydrogeo Support	(206) 438-7556
MATT JOHANSEN	USACE for RL	tech Support	6-9725
Ted Wooley	Ecology	OU Mgr DR-1 DR-2	736-3012
PAMELA INNIS	EPA	UNIT MANAGER	376-4919
Diana Dickie	WHC	WHC-Prog. Supp.	372-3141
John Collins	PRC	EPA-support	503-227-7516
Jim Field	WHC	Treatability	376-3753
DENNIS FAULK	EPA	OU Mgr	6-8631
[illegible]	[illegible]	[illegible]	[illegible]
JOHN HALL	WILDLIFE	NRDA/NRD OVERSIGHT	NONE AS OF YET
Evan Dresel	PNL	GW Surveillance	6-8341
Richard Biggerstaff	WHC	100 Area GW	6 5634
A. D. Knepp	WHC	100 Area source OU	6 5634
Karen Jones	Dames & Moore	RL Support	946-0176
Brian Drost	USGS	EPA Support	206-593-6510
N.M. Naiknimbalkar	WHC	coordinator	509-376-8739
J.G. WOODARD	WHC	Treatability Studies	376-2539
[illegible]	[illegible]	[illegible]	[illegible]
Steve Goss	Ecology		
Steve Frigut	PNL	Risk	6-9799
Andree DeAngelis	PRC	EPA Support	206 624-2692

100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
June 23, 1993

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
KEVIN KYTOLA	WHC	100-BC-1/2	2-1662
Jim DUNCAN	WHC	100-HR-3	2-0896
JERRY VOKAL	Ecology	TECH SUPPORT 100-HR-3	736-1009
Tom JONES	PNL	OHE	375-2710
Jack Donnelly	Ecology	100 Area Mgr.	736-3013
Sky Bradley	WHC	Project Planning	376-3382

93-AMA-100

Attachment #3
Agenda

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 23, 1993

100 Area General Discussions

- M-30-05 - Robert E. Peterson
- QRA Update - Nancy Lane
- **QRA & LFI Update** - Robert Henckel
- **Treatability Studies**
  - **100-HR-1 Excavation Treatability Study** - Jil Frain
  - **Soil Washing Treatability Study** - Jim Field
  - **100-HR-3 Treatability Study** - Jim Duncan

Operable Unit Status - Questions - Naiknimbalkar/Ayres/Krug/Steve Vukelich/Jim Roberts/Kytola

Action Item Status

Attachment #4

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 23, 1993

Action Item Status List

ITEM NO.	ACTION	STATUS
1AAMS.9	DOE shall send a letter to Ecology, suggested from S. H. Wisness to D. Jansen with a cc. to EPA, explaining what is included in the ER Program for the N Reactor Area and how the multiple programs will be handled organizationally. Action to J. D. Goodenough (2/27/92). Action: E. D. Goller (5/27/92).	Open. Related to the N Areas Issues Papers. No answer 7/29/92. No additional information (8/26/92). On General Topics Agenda for October (9/23/92). No new information (6/23/93).
1AAMS.15	Provide response to April 2 EPA letter concerning river seeps. Action: Eric Goller (RL) 7/29/92.	Open (7/29/92). In DOE for transmittal (8/26/92). No additional information (6/23/93).
1AAMS.16	DOE should transmit Revision 1 of M-30-01.	Open (7/29/92). In DOE for transmittal (8/26/92). No additional information (6/23/93).

STATUS PACKAGE

100 AREA UNIT MANAGER'S MEETING

JUNE 23, 1993

100 AREA TREATABILITY TEST STATUS
June 1993, Unit Managers Meeting

Soil Washing

Soil washing tests are on schedule. Wet sieving of samples is completed and analyses are in progress. Uranium and Plutonium analyses were completed: both of these were significantly below levels of concern. Attrition scrubbing tests are in progress. Microscopic analyses and X-Ray Diffraction are scheduled to begin this month.

A visit to the laboratory is scheduled for the third week in June.

Groundwater

Chromium precipitation/ion exchange:

The precipitation tests are completed to include the chromium and the uranium. The uranium detector is down due to laser problems and should be working within the next week. There is no impact to schedule as of this date. The data is coming in and Mark Beck will be going through analysis. The ion exchange experiments are beginning.

Biodenitrification:

Some inhibition has been indicated on well D5-15, but not enough to be concerned about. All testing has been accomplished to the large volume denitrification, which will begin on 16 June. The testing has shown that the attainment of the MCL for nitrates will be achievable though the use of the microbial population at Hanford.

Excavation

Test Plan has been submitted for public review. Work procedures are being prepared and are expected to be submitted to the regulators by early July. Kaiser has been issued a work order to prepare an estimate for construction of the soil storage unit.

Status of 100-Area Wide Activities
June 1992

River Impact Studies

Columbia River Impact Evaluation Plan. Public Review is scheduled to begin June 21, 1993 (Primary Document)

River sediment sampling field work, and sampling and validation completed. Validated Results submitted to regulators. The evaluation report is in preparation.

Cultural Resources Investigations

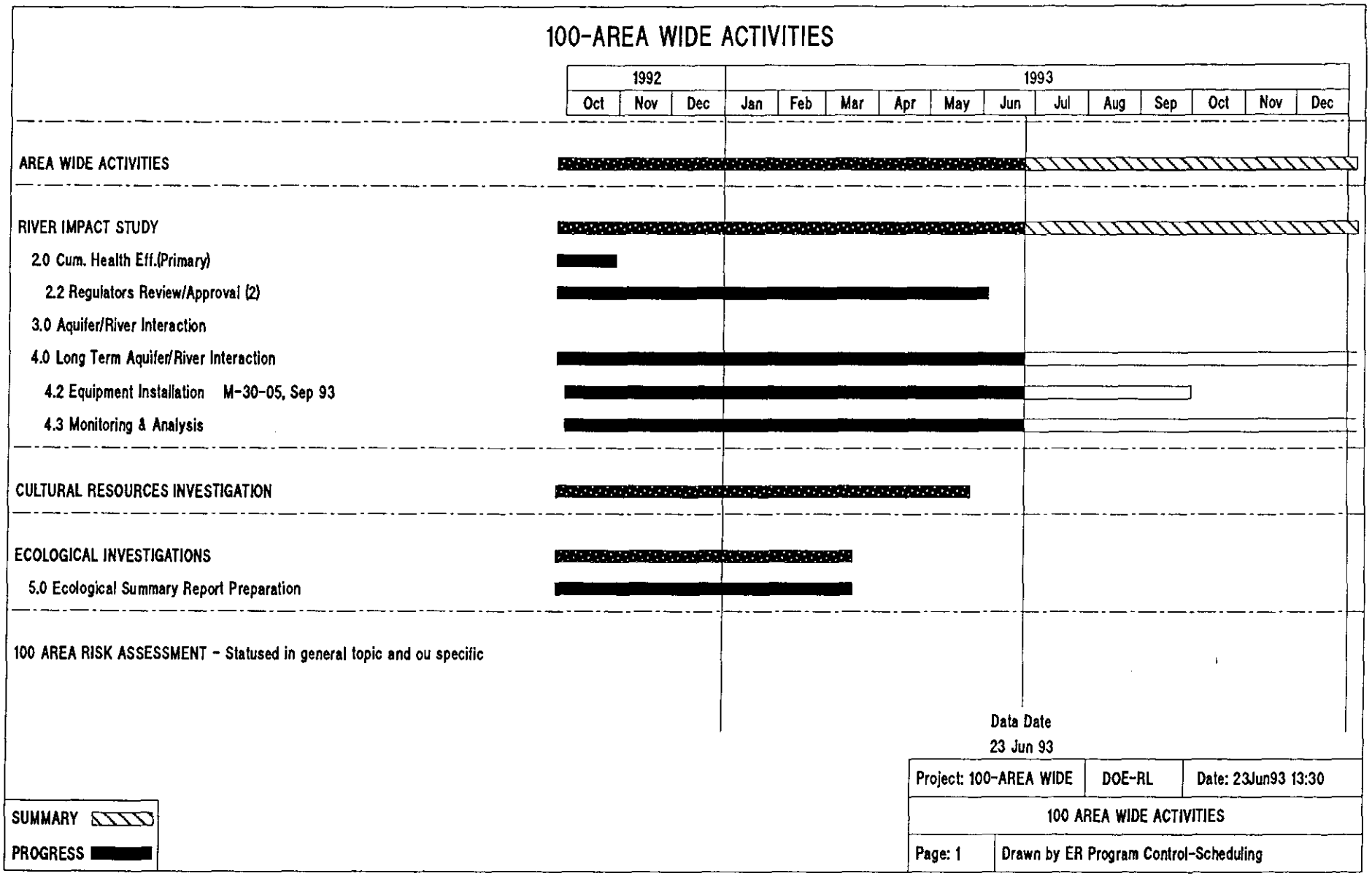
Evaluations of past excavations (from 100-K) and consultations with State Historic Preservation Office continues.

100-Area Ecological Investigations

Work has begun to delineate habitats of concern as identified in the Hanford Site Baseline Risk Assesment Methodology Report and the Columbia River Impact Evaluation Plan. (No change)

An initial draft of a literature search on the ecotoxicology of contaminants of concern for ecological investigations is in PNL and WHC review.

The 100 Areas CERCLA Ecological Investigations report, with analysis of sample results, is in preparation.


100-AREA WIDE ACTIVITIES
1992
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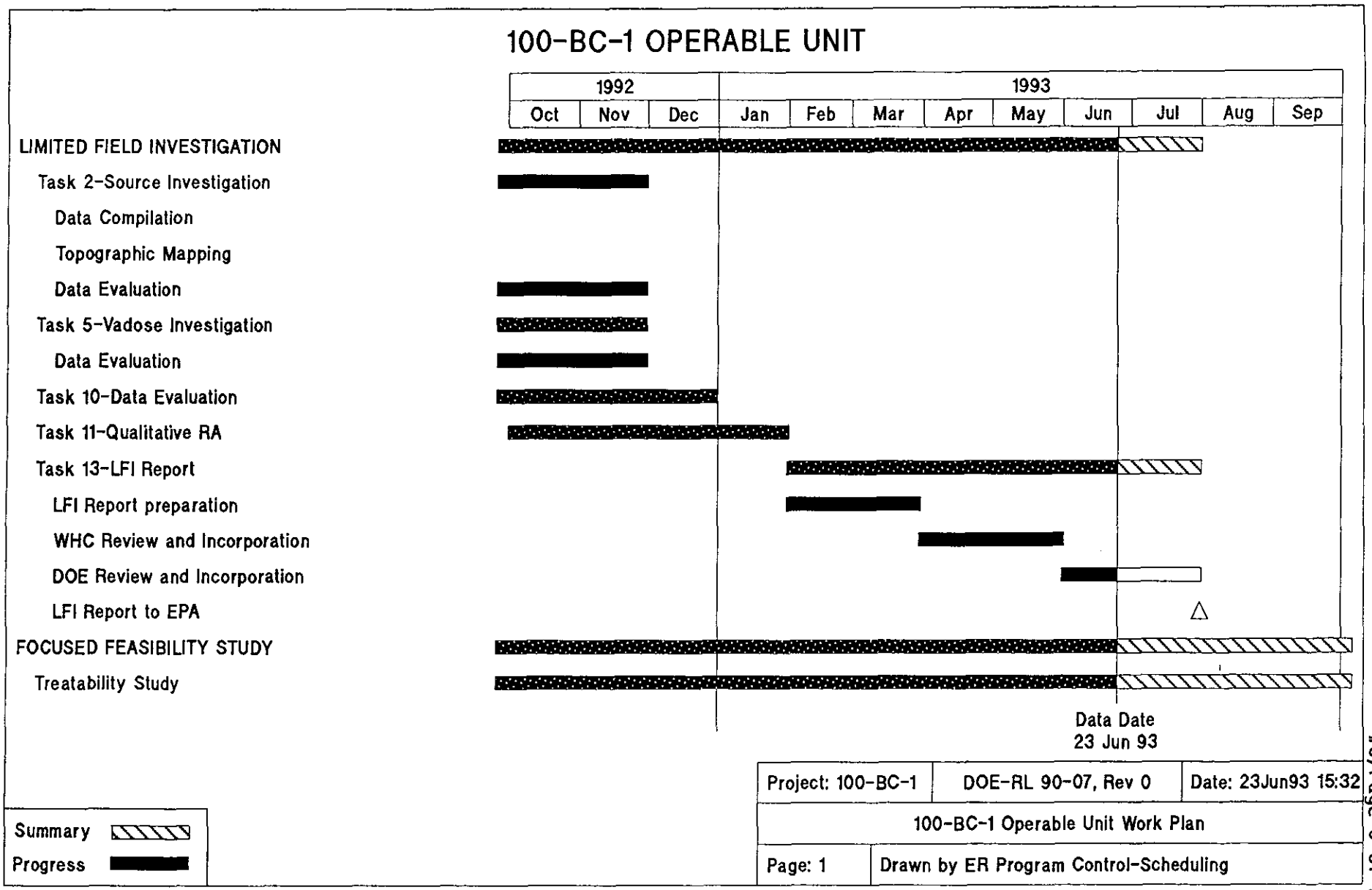
AREA WIDE ACTIVITIES
RIVER IMPACT STUDY
2.0 Cum. Health Eff.(Primary)
2.2 Regulators Review/Approval (2)
3.0 Aquifer/River Interaction
4.0 Long Term Aquifer/River Interaction
4.2 Equipment Installation M-30-05, Sep 93
4.3 Monitoring & Analysis
CULTURAL RESOURCES INVESTIGATION
ECOLOGICAL INVESTIGATIONS
5.0 Ecological Summary Report Preparation
100 AREA RISK ASSESSMENT - Statused in general topic and ou specific
Data Date
23 Jun 93
SUMMARY
PROGRESS
Project: 100-AREA WIDE
DOE-RL
Date: 23Jun93 13:30
100 AREA WIDE ACTIVITIES
Page: 1
Drawn by ER Program Control-Scheduling


100-BC-1 OPERABLE UNIT
1992
1993
Oct
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LIMITED FIELD INVESTIGATION
Task 2-Source Investigation
Data Compilation
Topographic Mapping
Data Evaluation
Task 5-Vadose Investigation
Data Evaluation
Task 10-Data Evaluation
Task 11-Qualitative RA
Task 13-LFI Report
LFI Report preparation
WHC Review and Incorporation
DOE Review and Incorporation
LFI Report to EPA
FOCUSED FEASIBILITY STUDY
Treatability Study
Data Date
23 Jun 93
Summary
Progress
Project: 100-BC-1
DOE-RL 90-07, Rev 0
Date: 23Jun93 15:32
100-BC-1 Operable Unit Work Plan
Page: 1
Drawn by ER Program Control-Scheduling

100-BC-1 SOURCE OPERABLE UNIT WORK SUMMARY
June 15, 1993

Task 11 - Qualitative Risk Assessment:

DOE/RL-HQ comments are currently being incorporated into the QRA and LFI.

Task 13 - Limited Field Investigation (LFI) Report:

The report has gone through DOE/RL-HQ review and comments are currently being incorporated. Submittal of the report to EPA and Ecology is scheduled for July 30, 1993.

100-BC-2 SOURCE OPERABLE UNIT WORK SUMMARY
June 15, 1993

RI/FS Work Plan:

The work plan is currently being review by EPA, Ecology and the public. The public review period is to be complete on July 6, 1993.

Field Activites:

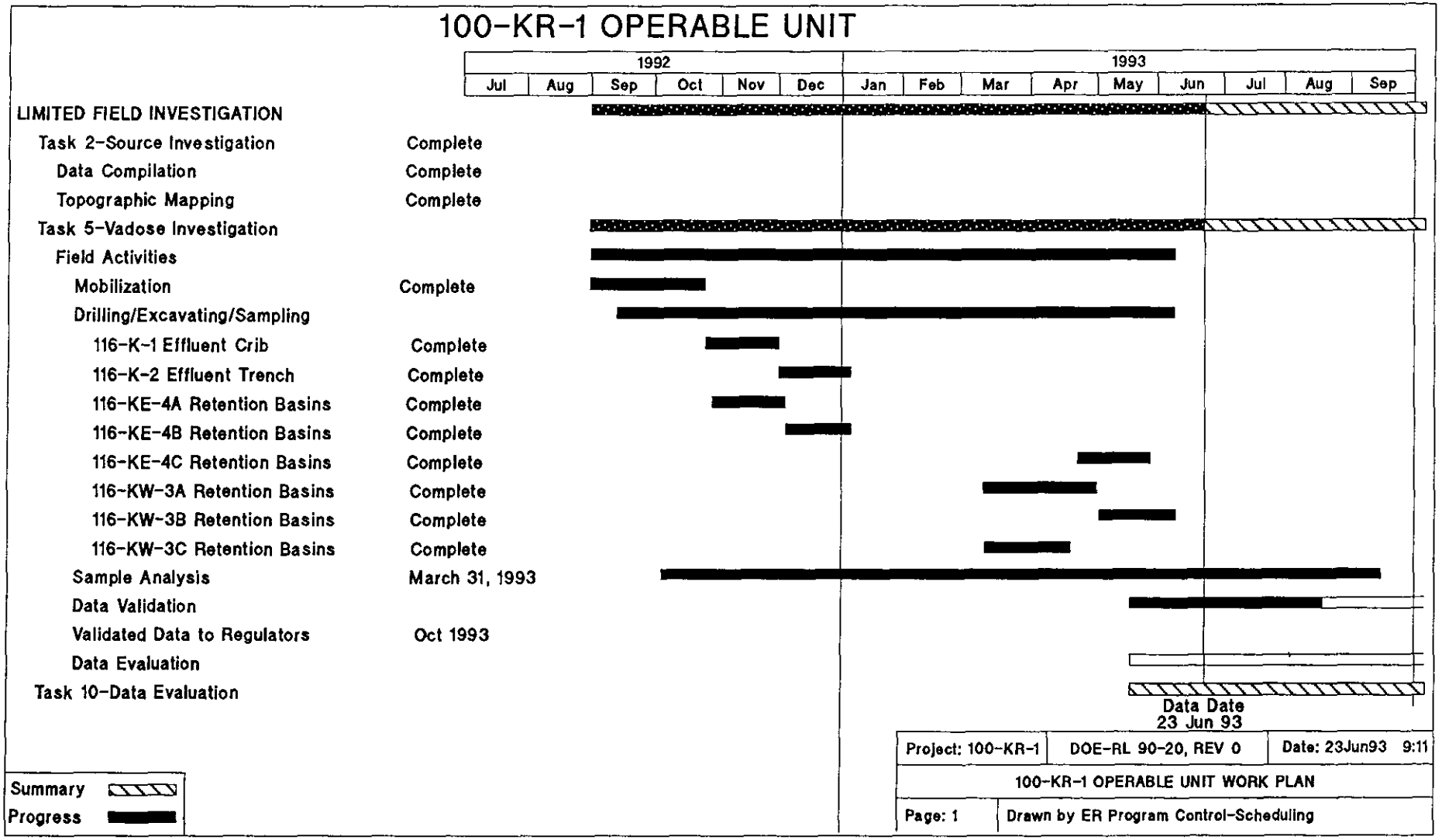
The description of work for the field activities in the 100-BC-2 Operable unit is currently being review by DOE/RL, EPA and Ecology. Comments are anticipated by June 14, 1993.

FY 1993 ACTIVITIES FOR 100-KR-1

JUNE 1993 STATUS REPORT
N.M. Naiknimbalkar

o	Four Vadose Boreholes		October/November 1992
	116-K-1	Effluent Crib	Completed
	116-K-2	Effluent Trench	Completed
	116-KE-4A	Retention Basin	Completed
	116-KW-3A	Retention Basin	Completed
o	Four Test Pits		
	116-KE-4B		Completed
	116-KE-4C		Completed
	116-KW-3B		Completed
	116-KW-3C		Completed
o	Sample Analysis		March 93
o	Data Validation		April 93

All vadose borehole and test pit sample validation data was submitted to DOE-RL for distribution to Regulators.


100-KR-1 OPERABLE UNIT
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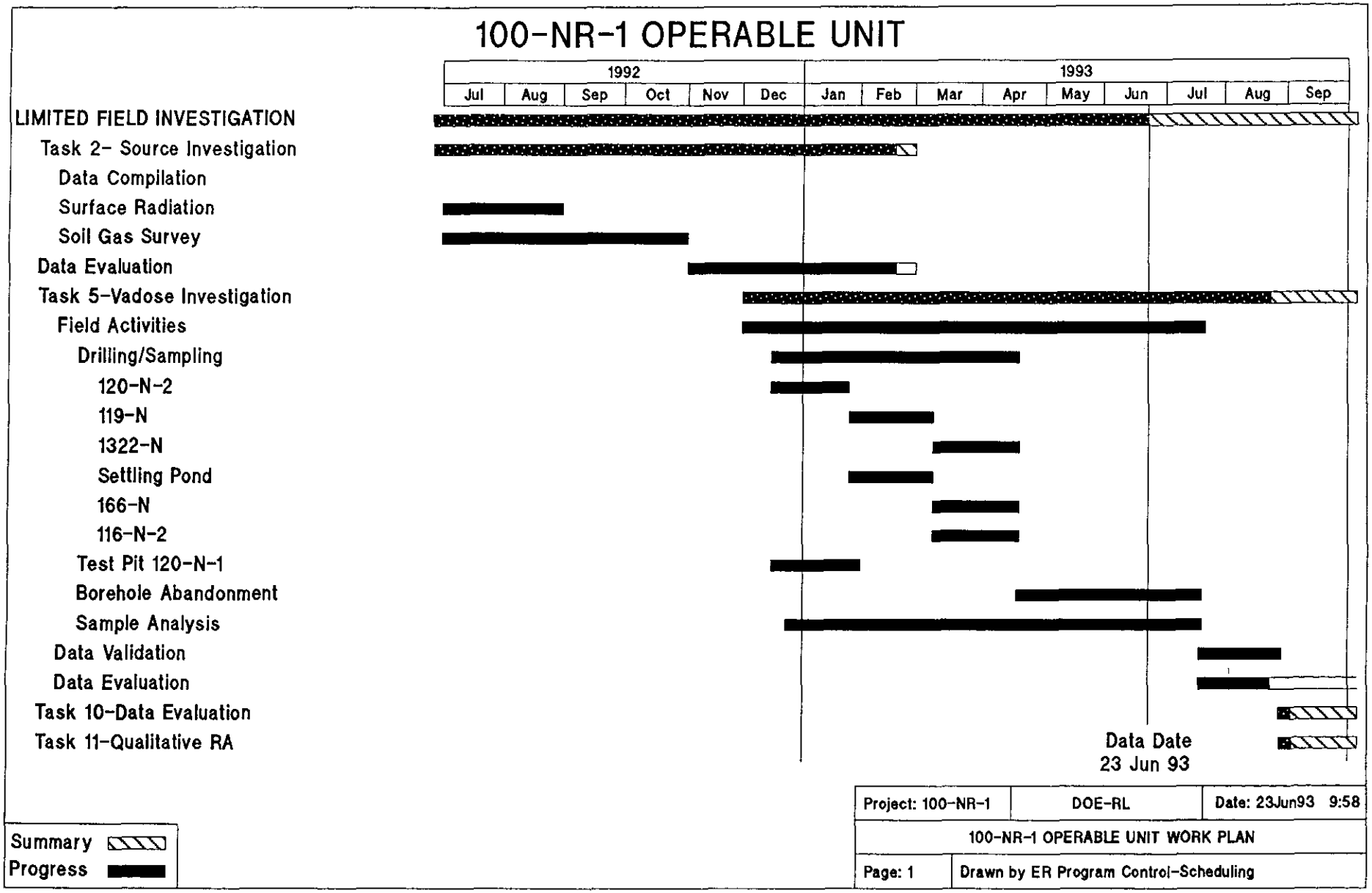
LIMITED FIELD INVESTIGATION
Task 2-Source Investigation
Complete
Data Compilation
Complete
Topographic Mapping
Complete
Task 5-Vadose Investigation
Field Activities
Mobilization
Complete
Drilling/Excavating/Sampling
116-K-1 Effluent Crib
Complete
116-K-2 Effluent Trench
Complete
116-KE-4A Retention Basins
Complete
116-KE-4B Retention Basins
Complete
116-KE-4C Retention Basins
Complete
116-KW-3A Retention Basins
Complete
116-KW-3B Retention Basins
Complete
116-KW-3C Retention Basins
Complete
Sample Analysis
March 31, 1993
Data Validation
Validated Data to Regulators
Oct 1993
Data Evaluation
Task 10-Data Evaluation
Data Date
23 Jun 93
Summary
Progress
Project: 100-KR-1
DOE-RL 90-20, REV 0
Date: 23Jun93 9:11
100-KR-1 OPERABLE UNIT WORK PLAN
Page: 1
Drawn by ER Program Control-Scheduling

100-NR-1

100-NR-1 - Surface Radiation Survey: A surface radiation survey is underway at the 100-NR-1 Operable Unit. This survey will complete the work initiated in FY'92, but cancelled due to high background readings in the arera. A shielded detection system is being used and is mounted on the new Rad Rover II. The system is functioning well and has located contamination which would not have otherwise been found.

The survey is approximately 60% complete (June 13, 1993) and is expected to be finished by June 30, 1993. Thirtyeight areas (6"x6") of elevated radiation have been identified and posted.


100-NR-1 OPERABLE UNIT
1992
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LIMITED FIELD INVESTIGATION
Task 2- Source Investigation
Data Compilation
Surface Radiation
Soil Gas Survey
Data Evaluation
Task 5-Vadose Investigation
Field Activities
Drilling/Sampling
120-N-2
119-N
1322-N
Settling Pond
166-N
116-N-2
Test Pit 120-N-1
Borehole Abandonment
Sample Analysis
Data Validation
Data Evaluation
Task 10-Data Evaluation
Task 11-Qualitative RA
Data Date
23 Jun 93
Summary
Progress
Project: 100-NR-1
DOE-RL
Date: 23Jun93 9:58
100-NR-1 OPERABLE UNIT WORK PLAN
Page: 1
Drawn by ER Program Control-Scheduling

FY 1993 Activities for 100-DR-1
N.M. Naiknimbalkar

JUNE 1993 Status Report

100-DR-1 QUALITATIVE RISK ASSESSMENT STATUS

Qualitative Risk Assessment
Document Preparation:

SAIC/Golder has prepared this report.

- Qualitative Risk Assessment Report was received on 3-31-93 and was released through Westinghouse Document Control System on 4-19-93. Copies were submitted to DOE-RL for distribution to Regulators.

LFI Report

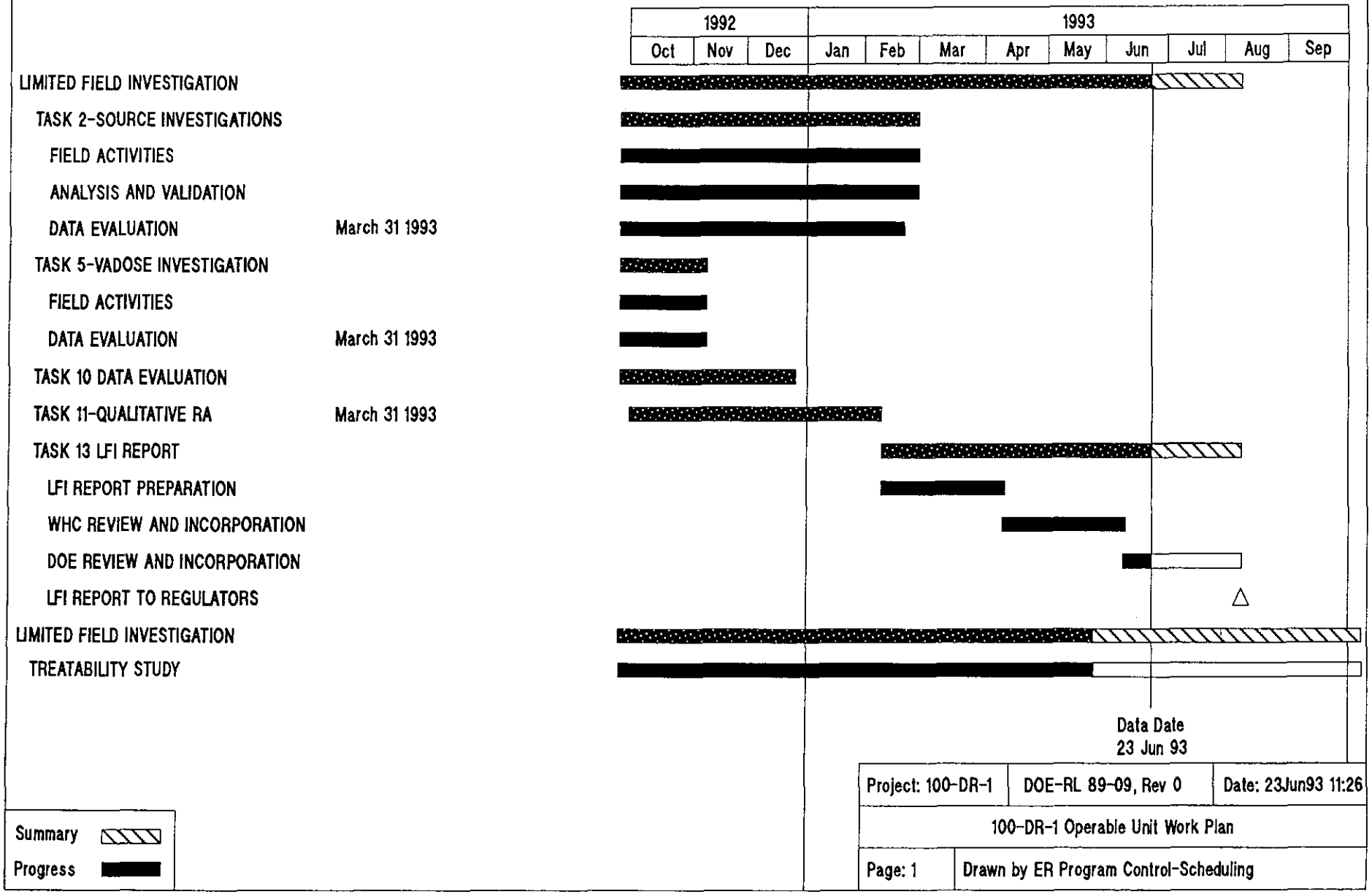
IT is preparing this document.

- LFI Report Due to Regulators: 08-09-93.

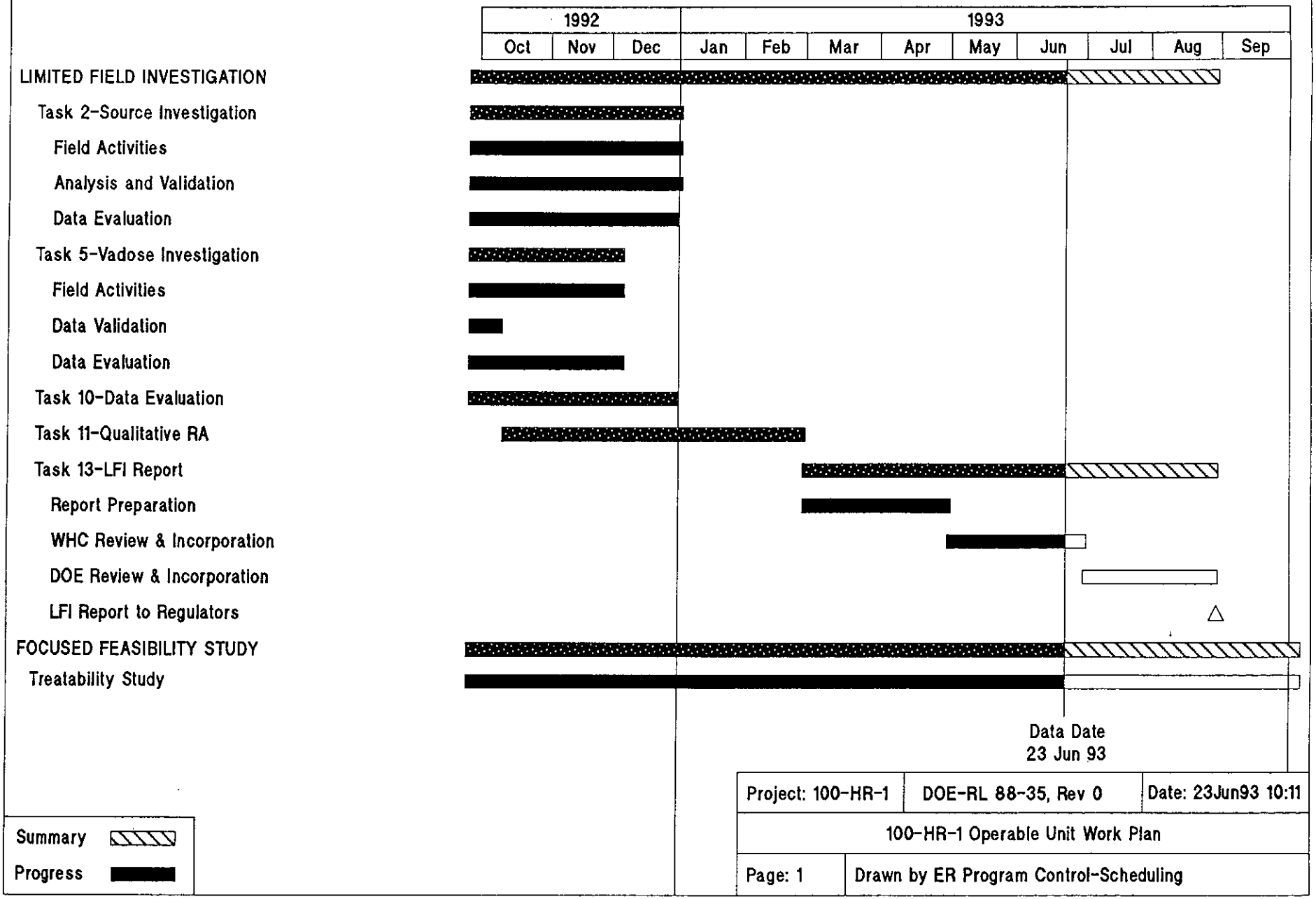
100-DR-2 Work Plan

- Scoping meetings were held with DOE-RL and the Regulators and agreement was reached for work scope to be included in the work plan. The work plan is progressing as scheduled.

100-DR-1 OPERABLE UNIT



100-HR-1 OPERABLE UNIT



100-HR-2

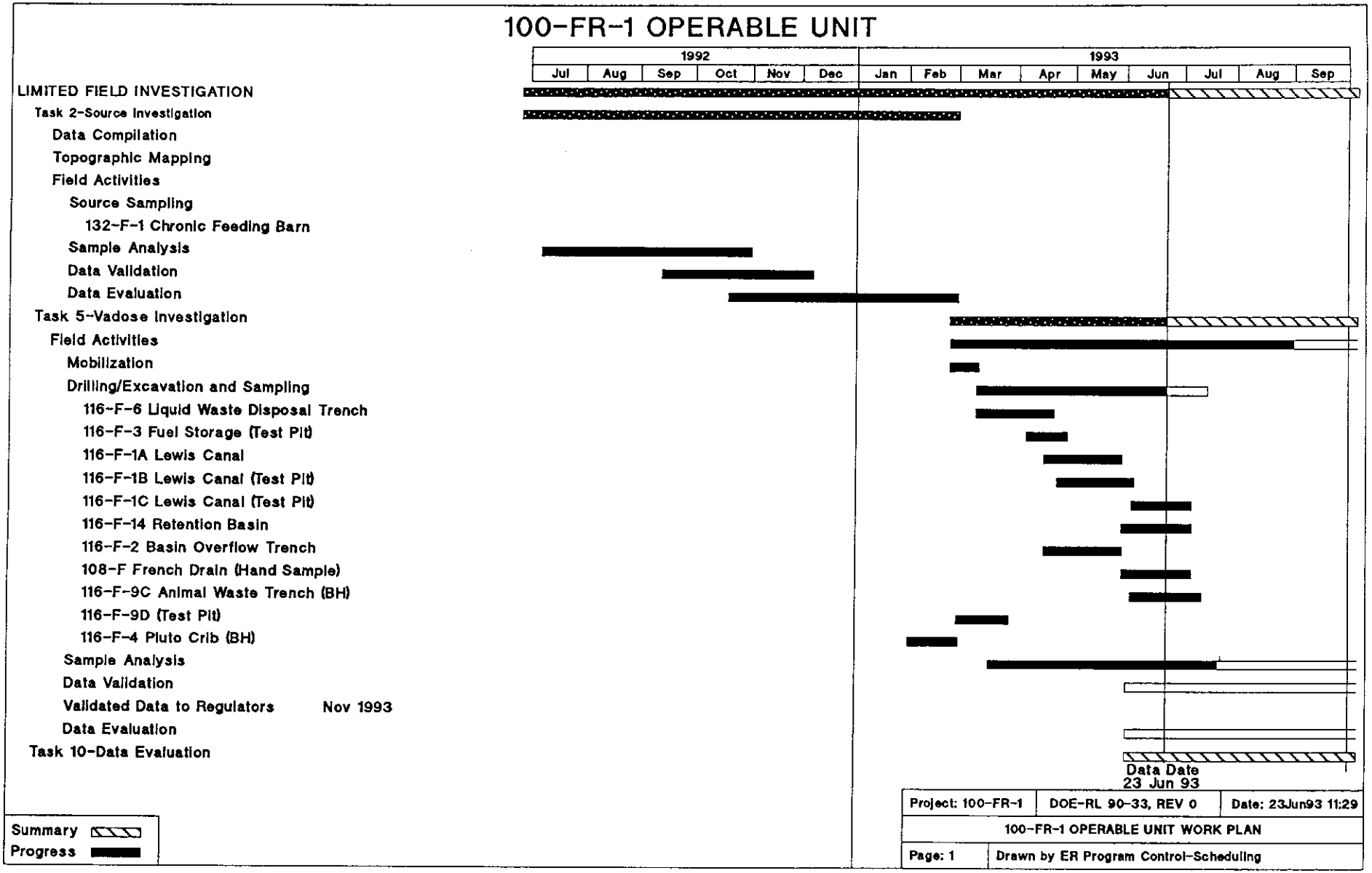
- Geophysical Exploration of select burial grounds has commenced. This survey is to confirm cell orientations and boundary extent. Selected sites are 118-H-1, 118-H-2, 118-H-3, and the Buried Thimble site. Other sites may be further investigated when needed.

OU MANAGERS MEETING - JUNE 93

100-FR-1

- Preliminary laboratory data from the Vadose boreholes is beginning to arrive. Approximately 65 samples were obtained. Ten percent of the samples will be validated.

100-FR-1 OPERABLE UNIT



100 HR-3 GROUNDWATER OPERABLE UNIT
WORK SUMMARY 6/23/93

TASK 6 - GROUNDWATER INVESTIGATION

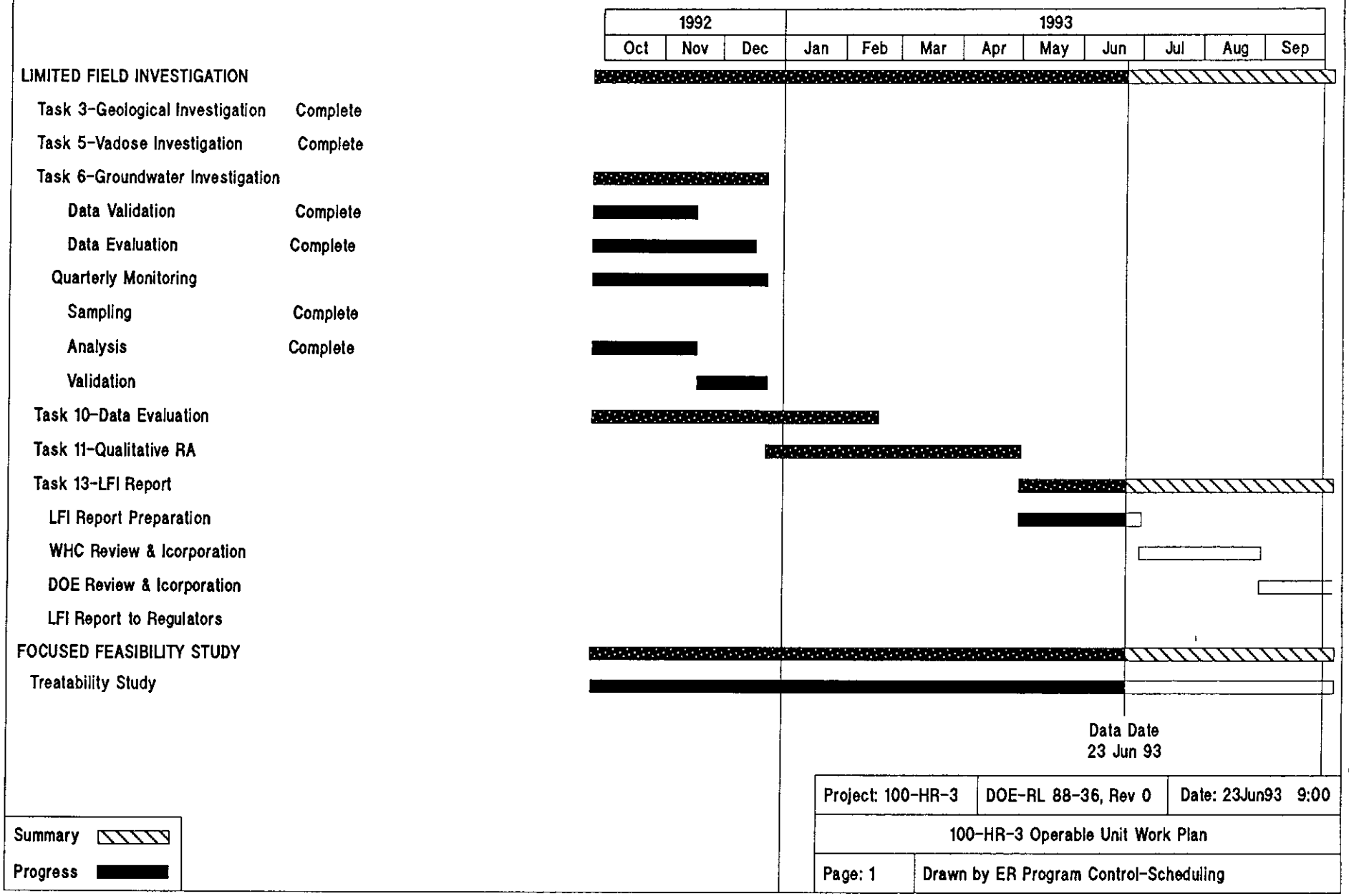
Quarterly Monitoring - Four rounds of groundwater samples have been taken. The fifth round is scheduled for August 1993 and will sample for a reduced analyte list.

Data Validation - First and second round groundwater data has been validated. The third round will be completed in early July.

LFI Report - The LFI Report is in progress and is scheduled for release in August.

QRA Report - The QRA Report is in progress and is scheduled for release in August.

100-HR-3 OPERABLE UNIT



100-BC-5 STATUS

- 1ST QUARTER (JULY), 2ND QUARTER (OCTOBER), 3RD QUARTER (JANUARY), 4TH QUARTER (APRIL) GROUNDWATER SAMPLING COMPLETE. SAMPLING WILL BE ON A SEMI-ANNUAL BASIS STARTING IN OCTOBER 1993.

- SAMPLE VALIDATION REPORTS FOR DRILLING SAMPLE DATA AND 1ST QUARTER GW SUBMITTED DECEMBER 31, 1992

- SAMPLE VALIDATION REPORT FOR 2ND QUARTER GW SUBMITTED APRIL 14, 1993

- SAMPLE VALIDATION REPORT FOR 3RD QUARTER GW SUBMITTED JUNE 1, 1993

- LFI REPORT ACTIVITIES IN PROGRESS

100-KR-4 STATUS

- 1ST QUARTER (SEPTEMBER), 2ND QUARTER (DECEMBER), 3RD QUARTER (MARCH) GROUNDWATER SAMPLING COMPLETE

- SAMPLE VALIDATION REPORTS FOR DRILLING SAMPLE DATA AND 1ST QUARTER GW SUBMITTED MARCH 12, 1993

- QUALITATIVE RISK ASSESSMENT IN PROGRESS

100-FR-3 STATUS

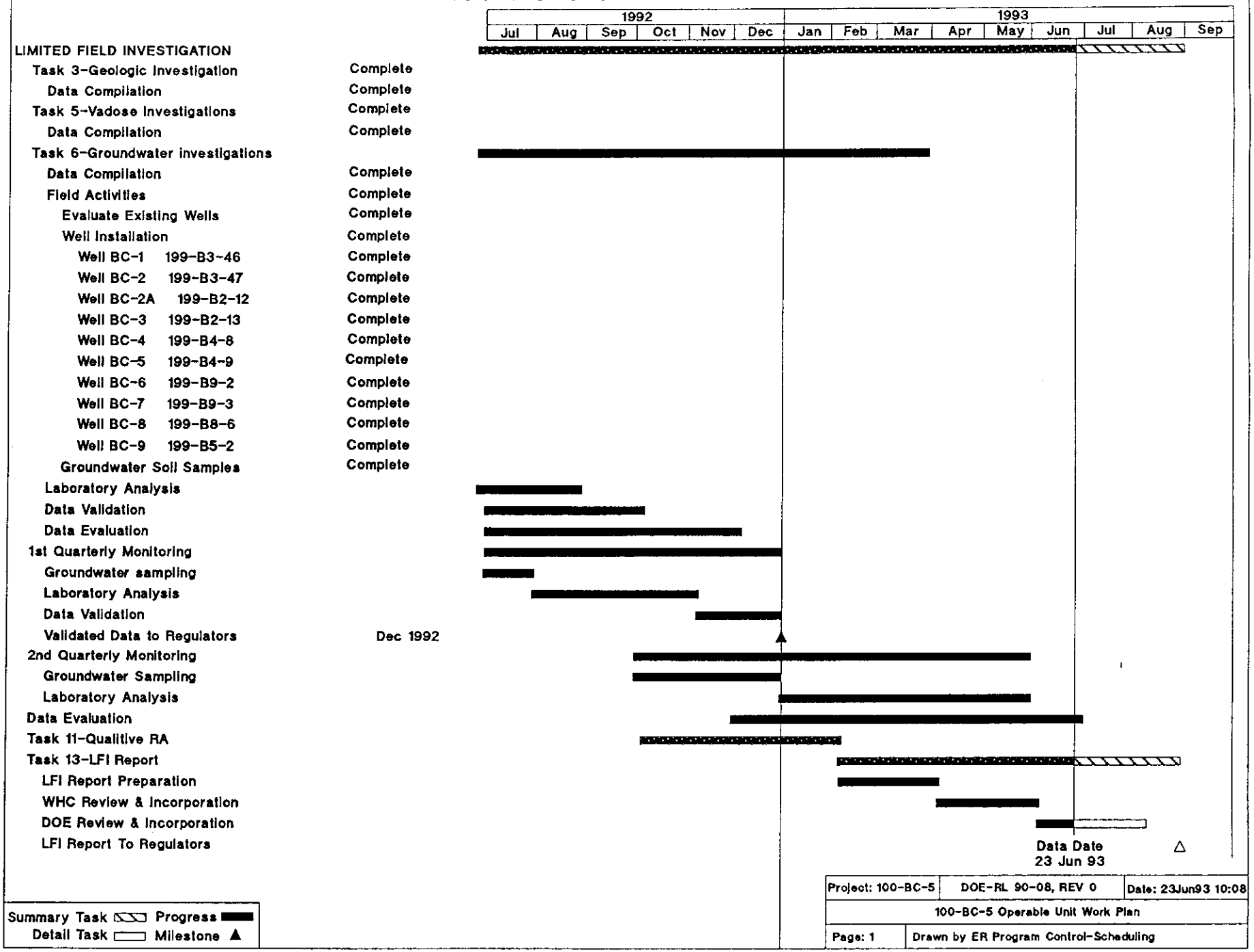
- ALL FY92 DRILLING ACTIVITIES COMPLETE (DECEMBER)

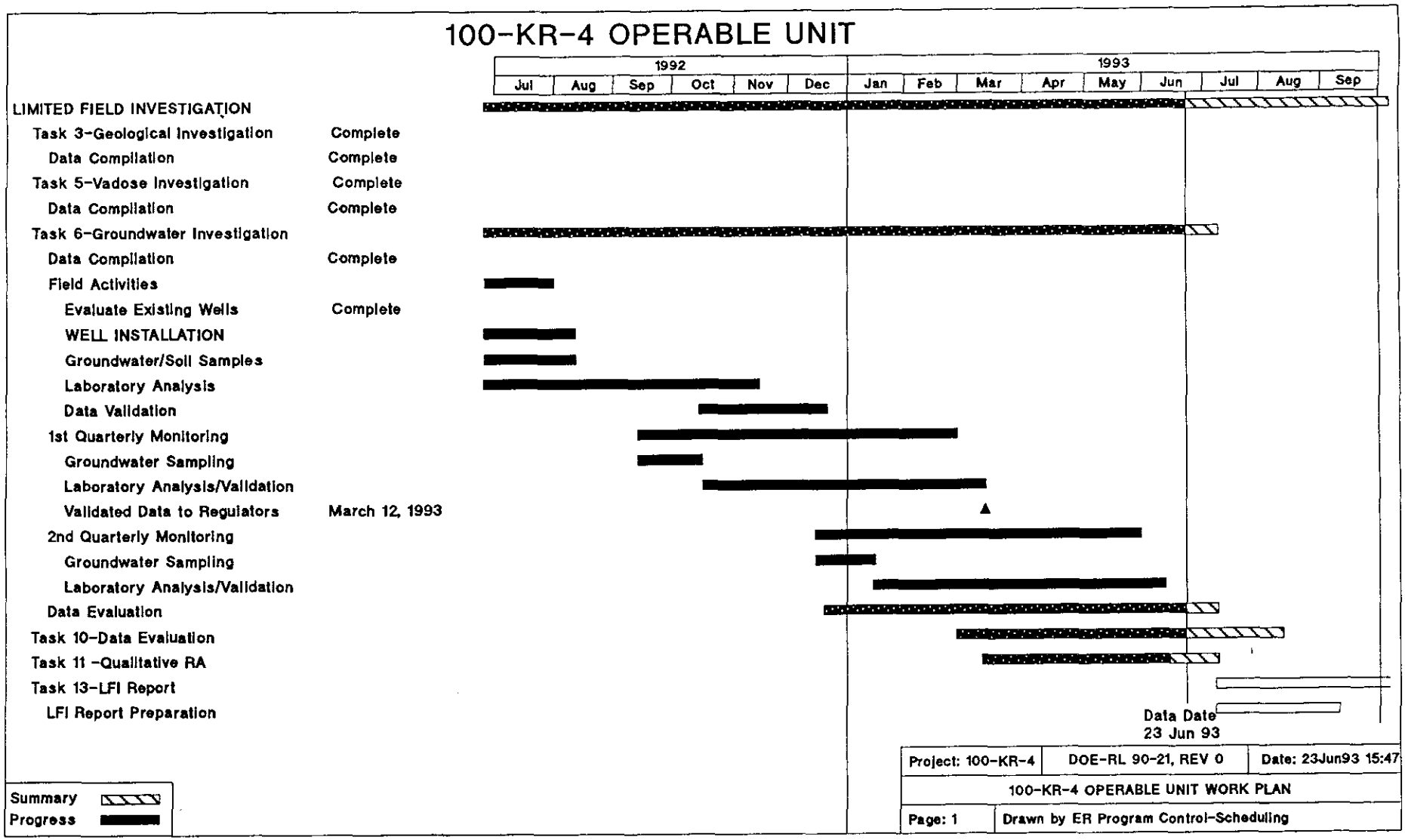
- 1ST QUARTER (DECEMBER), 2ND QUARTER (APRIL) GROUNDWATER SAMPLING COMPLETE

- SAMPLE VALIDATION REPORT FOR DRILLING SAMPLE DATA SUBMITTED MARCH 12, 1993

- SAMPLE VALIDATION REPORT FOR 1ST QUARTER GW SUBMITTED JUNE 14, 1993

100-BC-5 OPERABLE UNIT




100-KR-4 OPERABLE UNIT
1992
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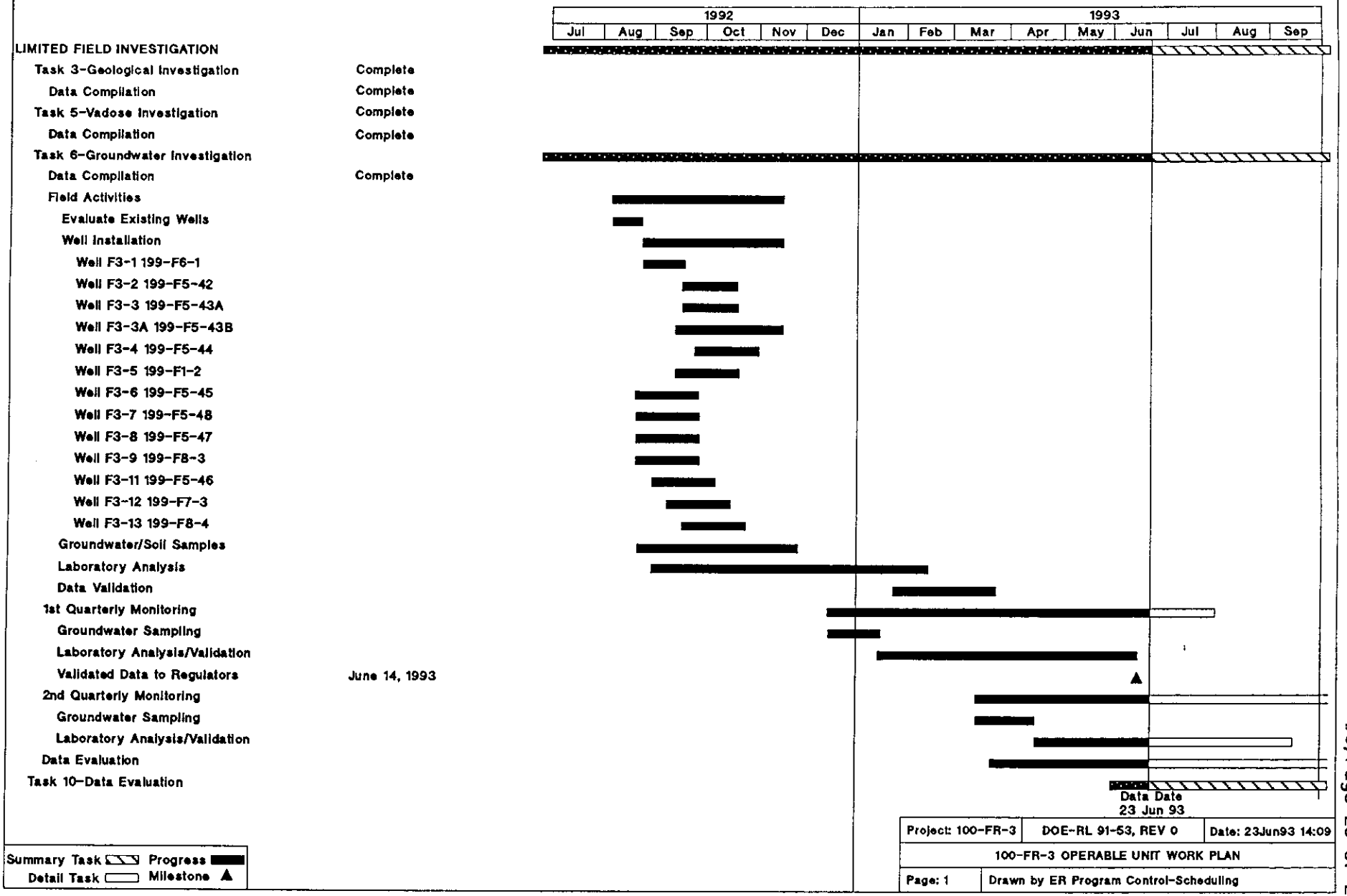
LIMITED FIELD INVESTIGATION
Task 3-Geological Investigation
Complete
Data Compilation
Complete
Task 5-Vadose Investigation
Complete
Data Compilation
Complete
Task 6-Groundwater Investigation
Data Compilation
Complete
Field Activities
Evaluate Existing Wells
Complete
WELL INSTALLATION
Groundwater/Soil Samples
Laboratory Analysis
Data Validation
1st Quarterly Monitoring
Groundwater Sampling
Laboratory Analysis/Validation
Validated Data to Regulators
March 12, 1993
2nd Quarterly Monitoring
Groundwater Sampling
Laboratory Analysis/Validation
Data Evaluation
Task 10-Data Evaluation
Task 11 -Qualitative RA
Task 13-LFI Report
LFI Report Preparation
Data Date
23 Jun 93
Summary
Progress
Project: 100-KR-4
DOE-RL 90-21, REV 0
Date: 23Jun93 15:47
100-KR-4 OPERABLE UNIT WORK PLAN
Page: 1
Drawn by ER Program Control-Scheduling

100-FR-3 OPERABLE UNIT



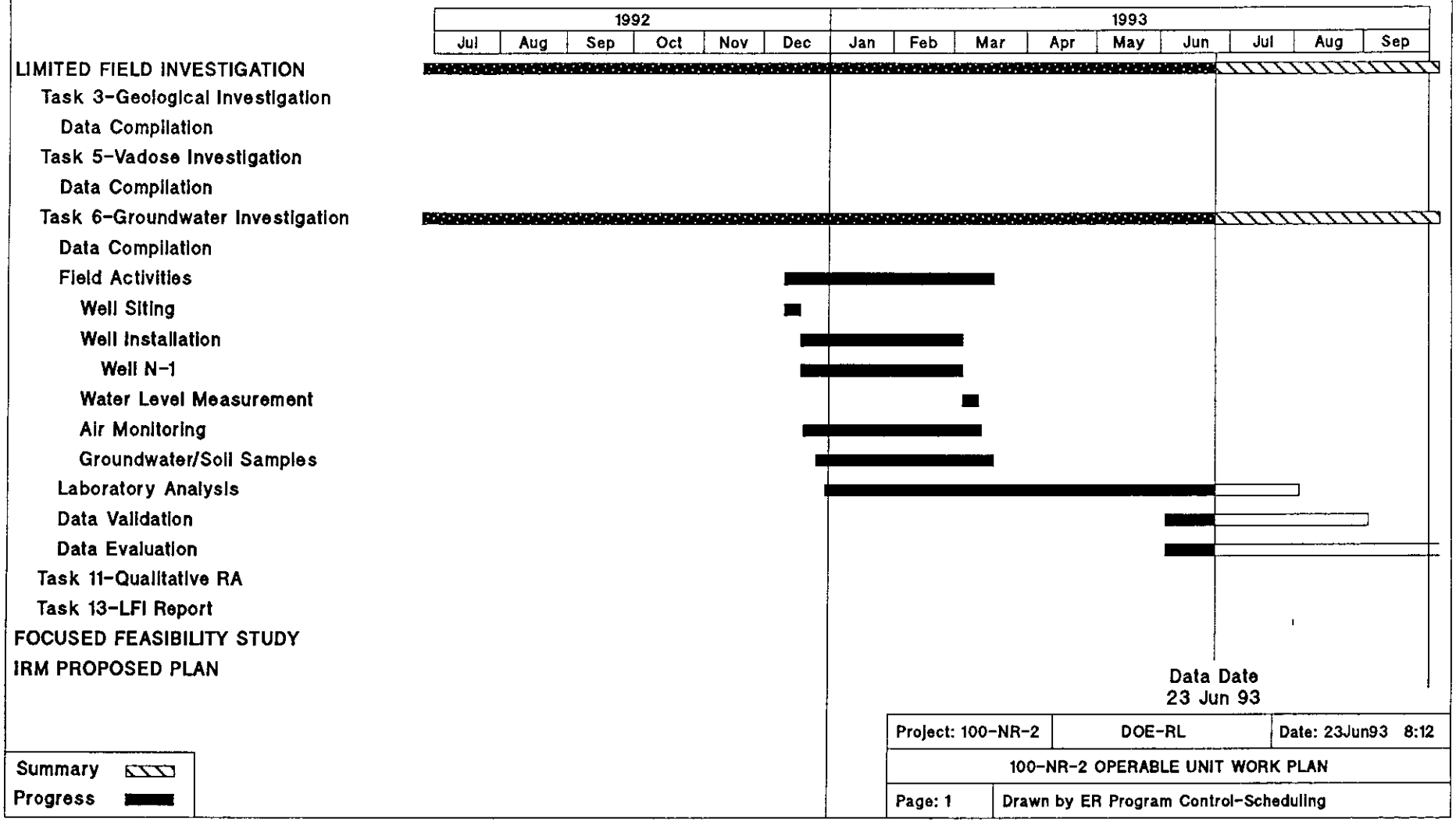
100 NR-2 GROUNDWATER OPERABLE UNIT
WORK SUMMARY 6/23/93

TASK 6 - GROUNDWATER INVESTIGATION

Quarterly Monitoring - Four rounds of groundwater samples have been taken.

Data Validation - The soil data has been validated.

100-NR-2 OPERABLE UNIT



100 AREA QUALITATIVE RISK ASSESSMENT (QRA) UPDATE
JUNE 23, 1993

PROBLEM STATEMENT

The QRAs were developed to assist in deciding whether a site required an interim remedial measure. The scenarios selected for the human health evaluation were bounding estimates of risk based on frequent (365 days) and occasional (7 days) use of the waste sites. Assumptions used in the calculations are those given in the Hanford Site Baseline Risk Assessment Methodology for residential (365 days) and recreational (7 days) land use.

It soon became clear that the methodology could use some enhancement when radionuclides were evaluated. The risk driving scenario for source operable units was the external exposure to radionuclides. Oftentimes, there was more risk to a person if they were standing next to the soil than if they ingested it. While this may be the actual case in some incidents, it probably does not represent the current situation at the site. Current site-wide monitoring programs exist to screen for external exposure to radionuclides and if real hazards are present the WHC and PNL programs would know of them.

This lead to an investigation of how radiation dose estimates are done. Three enhancements to the QRAs were selected from the knowledge gained through radiation dose.

HUMAN HEALTH ENHANCEMENTS - RADIONUCLIDES

1. Provide a breakdown of risk beyond 1 x 10^{-6}
2. Decay to the year 2018
3. Account for shielding of gamma rays

100 AREA QUALITATIVE RISK ASSESSMENT UPDATE
JUNE 23, 1993

CURRENT

The risk assessment summarizes the risk as follows:

HIGH	greater than 1×10^{-4}
MEDIUM	1×10^{-6} to 1×10^{-4}
LOW	less than 1×10^{-6}

ENHANCEMENT

2. Provide a breakdown of risk beyond 1×10^{-6}

~~VERY~~ HIGH	greater than 1×10^{-2}
~~HIGH~~ Medium	1×10^{-4} to 1×10^{-2}
~~MEDIUM~~ Low	1×10^{-6} to 1×10^{-4}
~~LOW~~ very Low	less than 1×10^{-6}

100 AREA QUALITATIVE RISK ASSESSMENT UPDATE
JUNE 23, 1993

CURRENT

Frequent Use (residential) at 1992

ENHANCEMENT

2. Frequent Use with radionuclide decay to the year 2018

Table 3-5a. Historical and LFI Data Summary for the 116-C-5 Retention Basin. (Sheet 1 of 6)

Parameter	Historical Data[a]				LFI Data[b]		QRA Data		
	Maximum Concentration	1/2 Life Years	Maximum Concentration	Depth ft.	Maximum Concentration	Depth ft.[c]	Concentration Used in QRA		Rationale for Selection
Radionuclides, pCi/g			Decayed to 1992				1992	2018	
Americium-241	-	4.3E+02	-	-	34	0	34	33	maximum concentration detected at or above 15 ft.
Carbon-14	260	5.7E+03	260	2	640	0	640	640	maximum concentration detected at or above 15 ft.
Cesium-134	1,700	2.1	8.6	2	ND	0	8.6	0.0016	maximum concentration detected at or above 15 ft.
Cesium-137	3,100	30	2,100	3.5	800	0	2,100	1,200	maximum concentration detected at or above 15 ft.
Cobalt-60	16,000	5.3	2,000	2	310	0	2,000	66	maximum concentration detected at or above 15 ft.
Europium-152	13,000	14	5,900	2.5	1,400	0	5,900	1,600	maximum concentration detected at or above 15 ft.
Europium-154	23,000	8.8	6,500	2	410	0	6,500	840	maximum concentration detected at or above 15 ft.
Europium-155	5,000	5	540	2	41	0	540	15	maximum concentration detected at or above 15 ft.
Nickel-63	5,100	100	4,600	2.5	-	-	4,600	3,800	maximum concentration detected at or above 15 ft.
Plutonium-238	9	88	7.9	2	9.4	0	9.4	7.7	maximum concentration detected at or above 15 ft.
Plutonium-239	230	2.4E+04	230	2	190	0	230	230	maximum concentration detected at or above 15 ft.
Radium-226	-	1.6E+03	-	-	0.84	0	0.84	0.84	maximum concentration detected at or above 15 ft.

Table 3-5d. Summary of the Risk Assessment for Radioactive Contaminants in 1992 at the 116-C-5 Retention Basin.

Contaminant	Frequent-Use Scenario				Occasional-Use Scenario			
	Pathway			Contaminant Totals	Pathway			Contaminant Totals
	Soil Ingestion	Fugitive Dust Inhalation	External Exposure		Soil Ingestion	Fugitive Dust Inhalation	External Exposure	
	ICR[a]	ICR[a]	ICR[a]		ICR[a]	ICR[a]	ICR[a]	
Americium-241	1E-05	1E-05	4E-06	2E-05	2E-07	2E-07	2E-08	4E-07
Carbon-14	8E-07	4E-11	-[b]	7E-07	1E-08	9E-13	-[b]	1E-08
Cesium-134	5E-07	3E-09	1E-03	1E-03	9E-09	5E-11	7E-06	7E-06
Cesium-137	8E-05	4E-07	>1E-02	>1E-02	2E-06	9E-09	7E-04	7E-04
Cobalt-60	4E-05	3E-06	>1E-02	>1E-02	8E-07	6E-08	2E-03	2E-03
Europium-152	2E-05	7E-06	>1E-02	>1E-02	3E-07	1E-07	3E-03	3E-03
Europium-154	3E-05	1E-05	>1E-02	>1E-02	5E-07	2E-07	4E-03	4E-03
Europium-155	3E-07	1E-07	7E-04	7E-04	6E-09	2E-09	5E-06	5E-06
Nickel-63	1E-06	9E-08	-[b]	1E-06	3E-08	2E-09	-[b]	3E-08
Plutonium-238	3E-06	4E-06	6E-09	7E-06	5E-08	6E-08	4E-11	1E-07
Plutonium-239	7E-05	1E-04	9E-08	2E-04	1E-06	2E-06	6E-10	3E-06
Radium-226	1E-07	3E-08	1E-04	1E-04	3E-09	5E-10	8E-07	8E-07
Strontium-90	4E-05	5E-07	-[b]	4E-05	7E-07	1E-08	-[b]	7E-07
Thorium-228	7E-08	8E-07	1E-04	1E-04	1E-09	1E-08	8E-07	8E-07
Thorium-232	1E-08	3E-07	6E-10	3E-07	3E-10	5E-09	4E-12	5E-09
Tritium	1E-07	1E-09	-[b]	1E-07	2E-09	3E-11	-[b]	2E-09
Uranium-234	3E-08	4E-07	1E-09	4E-07	6E-10	8E-09	6E-12	9E-09
Uranium-235	2E-09	2E-08	5E-07	5E-07	3E-11	4E-10	3E-09	3E-09
Uranium-238	6E-07	9E-06	1E-05	1E-05	1E-08	2E-07	9E-08	3E-07
Total	3E-04	1E-04	>1E-02	-	6E-06	3E-06	1E-02	-
High Priority Waste Site Total				>1E-02				1E-02

[a]Lifetime incremental cancer risk.
[b]Not an external exposure hazard.
- = Not applicable.

Note: Shaded area indicates screening criterion exceeded.

Table 3-5e. Summary of the Risk Assessment for Radioactive Contaminants in 2018 at the 116-C-5 Retention Basin.

Contaminant	Frequent-Use Scenario			
	Pathway			Contaminant Totals
	Soil Ingestion	Fugitive Dust Inhalation	External Exposure	
	ICR[a]	ICR[a]	ICR[a]	
Americium-241	1E-05	1E-05	4E-06	2E-05
Carbon-14	7E-07	4E-11	[b]	7E-07
Cesium-134	9E-11	5E-13	2E-07	2E-07 *
Cesium-137	4E-05	2E-07	>1E-02	>1E-02
Cobalt-60	1E-06	1E-07	>1E-02	>1E-02
Europium-152	4E-06	2E-06	>1E-02	>1E-02
Europium-154	3E-06	1E-06	>1E-02	>1E-02
Europium-155	9E-09	3E-09	2E-05	2E-05 *
Nickel-63	1E-06	8E-08	[b]	1E-06
Plutonium-238	2E-06	3E-06	5E-09	5E-06
Plutonium-239	7E-05	1E-04	1E-07	2E-04
Radium-226	1E-07	3E-08	1E-04	2E-04
Strontium-90	2E-05	3E-07	[b]	2E-05
Thorium-228	5E-12	6E-11	1E-08	1E-08 *
Thorium-232	1E-08	3E-07	5E-10	3E-07
Tritium	3E-08	3E-10	[b]	3E-08
Uranium-234	3E-08	4E-07	1E-09	4E-07
Uranium-235	2E-09	2E-08	5E-07	5E-07
Uranium-238	6E-07	9E-06	1E-05	2E-05
Total	2E-04	1E-04	>1E-02	-
High Priority Waste Site Total				>1E-02

[a]Lifetime incremental cancer risk.
[b]Not an external exposure hazard.
- = Not applicable.

Note: Shaded area indicates screening criterion exceeded.

100 AREA QUALITATIVE RISK ASSESSMENT UPDATE
JUNE 23, 1993

CURRENT

Occasional Use (recreational) at 1992

ENHANCEMENT

3. Account for shielding of gamma rays

   - Review 1992 and 1993 site-monitoring radiation surveys and TLD data

   - Add a scenario which considers the external exposure to radionuclides in the soil from 0 to 6 ft (1.8 m) only. This is based on the idea that shielding from external exposure is provided by 6 ft (1.8 m) of soil. The nearly 2 meter depth is a conservative value. A one meter soil cover is likely to provide shielding.

Table F-1. Concentrations of Various Gamma Emitting Radionuclides Required to Provide a 10^{-6} Lifetime Incremental Cancer Risk via External Exposure[a].

Radionuclide	Risk-Based Concentration[b] (pCi/g)
Cobalt-60	1.5E+06
Cesium-134	6.9E+07
Cesium-137	2.3E+08
Europium-152	2.1E+06
Europium-154	3.5E+06
Radium-226	6.2E+05
Thorium-228	1.4E+04

[a]Assumes an infinite slab source with 6 ft of clean cover, and continuous exposure for 30 yr.
[b]Accounts for contribution of radioactive daughter products. Concentrations calculated with the use of RESRAD (Argonne 1992).

Note: Risk-based concentrations for other radionuclides would be higher than those presented here.

Table F-2. Risk Based Radionuclide Concentrations for the External Exposure Pathway Based on an Occasional-Use Scenario (1992) without Shielding.

Radionuclides	Concentration[a] at ICR = 10^{-6} (pCi/g)	Concentration[a] at ICR = 10^{-4} (pCi/g)
Americium-241	1.3E+03	1.3E+05
Cesium-134	1.3E+00	1.3E+02
Cesium-137	3.3E+00	3.3E+02
Cobalt-60	7.6E-01	7.6E+01
Europium-152	1.8E+00	1.8E+02
Europium-154	1.6E+00	1.6E+02
Europium-155	1.1E+02	1.1E+04
Plutonium-238	2.3E+05	2.3E+07
Plutonium-239/240	2.4E+05[b]	2.4E+07[b]
Potassium-40	1.2E+01	1.2E+03
Radium-226	1.1E+00	1.1E+02
Thorium-228	1.2E+00	1.2E+02
Thorium-232	2.5E+05	2.5E+07
Uranium-233/234	1.6E+05	1.6E+07
Uranium-235	2.7E+01	2.7E+03
Uranium-238	1.8E+02	1.8E+04

[a]Assumes radionuclides are uniformly distributed in soil (no shielding)
[b]Plutonium-240 slope factor was used for calculation
ICR = Lifetime incremental cancer risk

Note: Risk-based concentrations are not provided for carbon-14, nickel-63, strontium-90, and tritium (H-3) because they are not gamma emitters.

DRAFT

Table F-4. Summary of Radiation Surveys and TLD Data for 100-BC-1

Site	Radiation Survey Data[a]			TLD Data
	Below Background	Surface Contamination	Soil Contamination at Depth	
116-B-1	yes	yes	no	none
116-B-2	yes	no	no	none
116-B-3	yes	no	no	none
116-B-5	yes	no	no	none
116-C-5	yes	yes	yes	none
116-C-1	yes	yes	no	none
116-B-11	yes	yes	yes	none
116-B-4	yes	no	no	none
116-B-6B	yes	no	no	none
116-B-9	yes	no	no	none
116-B-10	yes	no	no	none
118-B-5	yes	no	no	none
116-B-7	yes	no	no	none
116-B-6A	yes	no	no	none

[a] Although surface contamination or soil contamination at depth may be present, some portion of each site is characterized by below background radiation levels.
TLD = Thermoluminescent dosimeter.

Table F-3. Summary of Maximum Concentrations of Radionuclides in 1992 at the 100-BC-1 Waste Sites. (Shee

Radionuclides	Depth (ft)	Site with UFI and Historical Data					Sites with Historical Data Only				
		116-B-1 pCi/g	116-B-2 pCi/g	116-B-3 pCi/g	116-B-5 pCi/g	116-C-5 pCi/g	116-C-1 pCi/g	116-B-11 pCi/g	Process Effluent Pipelines		116-B- pCi/g
									Diversion/ Junction Box pCi/g	Soil Samples pCi/g	
Americium-241	0-6	-	-	ND	-	34 (L)	-	-	-	-	-
	6-15	0.48 (L)	0.37 (L)	0.084 (L)	0.006 (L)	ND	-	-	-	-	-
	> 15	0.1(L)	ND	-	-	ND	-	-	-	-	-
Carbon-14	0-6	-	-	ND	-	640 (L)	-	260	12	-	-
	6-15	3.8 (L)	4 (L)	3.6 (L)	ND	ND	-	-	-	-	-
	> 15	6.2 (L)	ND	-	-	0.4(L)	-	-	-	-	-
Cesium-134	0-6	0.0003 (H)	ND	ND	-	8.6 (H)	0.0003	56[b]	18[b]	-	-
	6-15	ND	ND	ND	1.5E-04 (H)	ND	0.011	0.22	-	5.0E-04	2E-04
	> 15	0.00037 (H)	1.5E-04 (H)	-	ND	0.86 (H)	0.23	-	-	0.71	-
Cesium-137	0-6	0.08 (H)	-	ND	-	2,100[a] (H)	0.20	830[a]	110,000[a]	-	-
	6-15	44[b] (L)	91[b] (L)	79[b] (L)	0.31 (H)	0.1 (L)	36[b]	90	-	4.4[b]	210[b]
	> 15	25[b] (H)	26 (H)	-	ND	214 (H)	330[b]	290	-	4,600[a]	-
Cobalt-60	0-6	0.03	-	ND	-	2,000[a] (H)	0.09	4,400[a]	2,800[a]	-	-
	6-15	4.2[b] (L)	0.14 (L)	ND	2.6[b] (H)	ND	64[b]	32	-	2.2[b]	27[b]
	> 15	4.6[b] (H)	0.076 (H)	-	ND	170 (H)	220[a]	10	-	100[a]	-
Europium-152	0-6	0.3 (L)	-	ND	-	5,900[a] (H)	0.5	29,000[a]	17,000[a]	-	-
	6-15	120[b] (L)	10[b] (L)	ND	12[b] (H)	0.1 (H)	220[a]	70	-	5.9[b]	430[a]
	> 15	97[b] (H)	0.95 (H)	-	ND	530 (H)	410[a]	100	-	590[a]	-
Europium-154	0-6	ND	-	ND	-	6,500[a] (H)	0.16	8,200[a]	7,900[a]	-	-
	6-15	9.9[b] (L)	0.56 (L)	ND	2.5[b] (H)	ND	170[a]	13	-	0.88	45[b]
	> 15	14[b] (H)	0.0001 (H)	-	ND	0.023 (H)	100	280	-	100[b]	-
Europium-155	0-6	0.019 (H)	-	ND	-	540[b] (H)	0.03	510[b]	9,600[b]	-	-
	6-15	0.002 (H)	0.36 (H)	ND	0.015 (H)	ND	23	0.45	-	0.026	6.6
	> 15	1.2 (H)	0.08 (H)	ND	ND	3.8 (H)	3	7.8	-	3,300[b]	-
Nickel-63	0-6	ND	-	ND	-	4,600 (H)	-	ND	63,000	-	-
	6-15	ND	ND	ND	ND	ND	-	-	-	-	-
	> 15	ND	ND	-	-	ND	-	-	-	-	-
Plutonium-238	0-6	ND	-	ND	-	9.4 (L)	ND	7.7	140	-	-
	6-15	0.11(L)	0.033 (L)	0.035 (L)	ND	ND	ND	ND	-	-	0.29
	> 15	0.16 (L)	0.053 (L)	-	-	ND	ND	0.51	-	0.36	-

Table F-3. Summary of Maximum Concentrations of Radionuclides in 1992 at the 100-BC-1 Waste S

Radionuclides	Depth (ft)	Site with LFI and Historical Data					Sites with Historical Data Onl			
		116-B-1 pCi/g	116-B-2 pCi/g	116-B-3 pCi/g	116-B-5 pCi/g	116-C-5 pCi/g	116-C-1 pCi/g	116-B-11 pCi/g	Process Effluent Pipelines	
									Diversion/ Junction Box pCi/g	Soil Samples pCi/g
Plutonium-239/240	0-6	ND	-	ND	-	230 (H)	ND	340	2,800	-
	6-15	3.6 (L)	5.7 (L)	0.79 (L)	ND	ND	0.75	3.3	-	0.29
	>15	0.99 (H)	0.9 (H)	-	-	5.4 (H)	5.3	18	-	10
Potassium-40	0-6	ND	-	ND	-	ND	-	-	-	-
	6-15	16[b] (L)	ND	ND	ND	ND	-	-	-	-
	>15	1 (L)	ND	-	-	ND	-	-	-	-
Radium-226	0-6	ND	-	ND	-	0.84 (L)	-	-	-	-
	6-15	ND	ND	ND	ND	ND	-	-	-	-
	>15	ND	ND	-	-	ND	-	-	-	-
Strontium-90	0-6	0.009 (H)	-	ND	-	770 (L)	0.27	210	2,000	-
	6-15	13 (L)	64 (L)	39 (L)	0.15 (L)	ND	0.54	3.3	-	1.6
	>15	4.2 (H)	30 (H)	-	-	63 (H)	67	2.6	-	140
Thorium-228	0-6	ND	-	ND	-	0.91 (L)	-	-	-	-
	6-15	ND	ND	ND	ND	ND	-	-	-	-
	>15	ND	ND	-	-	ND	-	-	-	-
Thorium-232	0-6	ND	-	ND	-	0.88 (L)	-	-	-	-
	6-15	ND	ND	ND	ND	ND	-	-	-	-
	>15	ND	ND	-	-	ND	-	-	-	-
Tritium	0-6	-	-	ND	-	1,800 (H)	0.33	100	2.4	-
	6-15	-	14 (H)	ND	29,000 (H)	ND	1.7	8.7	-	-
	>15	1.1 (H)	13 (H)	-	180 (H)	3.7 (H)	16	17	-	48
Uranium-234[c]	0-6	-	-	ND	-	1.4 (L)	-	-	-	-
	6-15	-	ND	ND	ND	0.8 (H) L	-	-	-	-
	>15	-	ND	-	-	8 (H) L	-	-	-	-
Uranium-235[c]	0-6	-	-	ND	-	0.081 (L)	-	-	-	-
	6-15	-	ND	ND	-	ND	-	-	-	-
	>15	-	ND	-	-	ND	-	-	-	-

Table F-3. Summary of Maximum Concentrations of Radionuclides in 1992 at the 100-BC-1 Waste Sites.

Radionuclides	Depth (ft)	Site with LFI and Historical Data					Sites with Historical Data Only			
		116-B-1 pCi/g	116-B-2 pCi/g	116-B-3 pCi/g	116-B-5 pCi/g	116-C-5 pCi/g	116-C-1 pCi/g	116-B-11 pCi/g	Process Effluent Pipelines	
									Diversion/ Junction Box pCi/g	Soil Samples pCi/g
Uranium-238[c]	0-6	-	-	ND	-	3 (H)	-	9.0	0.65	-
	6-15	-	ND	ND	ND	ND	0.31	0.39	-	-
	>15	0.28 (H)	0.24 (H)	-	-	16 (H)	0.32	0.42	-	0.52

(L) = LFI data; (H) = Historical data
ND = Analyzed for but not detected
- = Not analysed for or not reported
[a] Shaded area indicates maximum concentrations exceeding risk-based concentration at 10^{-4}
[b] Shaded area indicates maximum concentrations exceeding risk-based concentration at 10^{-6} only
[c] If uranium isotope is not specified, it is assumed to be present as uranium-238

DRAFT

Qualitative Ecological Risk Assessment (QERA)

Approach:

Estimate Potential Present and Future Ecological Risk
Model Intensive

Problem Formulation:

Ecosystem Potentially at Risk
Organisms Present in Waste Site
Endpoint - Assessment = Measurement

Conceptual Model:

Selected Ecological Receptors
Likely Found in Waste Site
High Use
Great Basin pocket mouse

Qualitative Ecological Risk Assessment (QERA)

Definition:

Limited Scope (Scale) Ecological Risk Assessment

Approach:

Streamline/Efficiency
Limited Field Investigations
Utilize Existing Data

Purpose:

Screen Risk Between Individual Waste Sites
Provide Information to Support IRM Path

ENVIRONMENTAL EVALUATION

ECOLOGICAL EXPOSURE SCENARIO

Current Approach:

- **Maximum Soil Concentrations From 0-15 Ft Depth**
- **Soil Concentration Is All Biologically Active**
- **Uniform Soil Contamination Over Waste Site**

Result:

- **Extremely Conservative Exposure Scenario**

ECOLOGICAL EXPOSURE SCENARIO

Additional Approach:

- Maximum Soil Concentration From 0-7 Ft (0-2 m) Depth
- Maximum Soil Concentration Is All Biologically Available
- Uniform Soil Contamination Over Waste Site
- Incorporation of Mouse Life Cycle

Result:

- Exposure Scenario Approaching Ecological Relevance

100-HR-3 GROUNDWATER TREATABILITY TESTS

UNIT MANAGERS MEETING

JUNE 1993

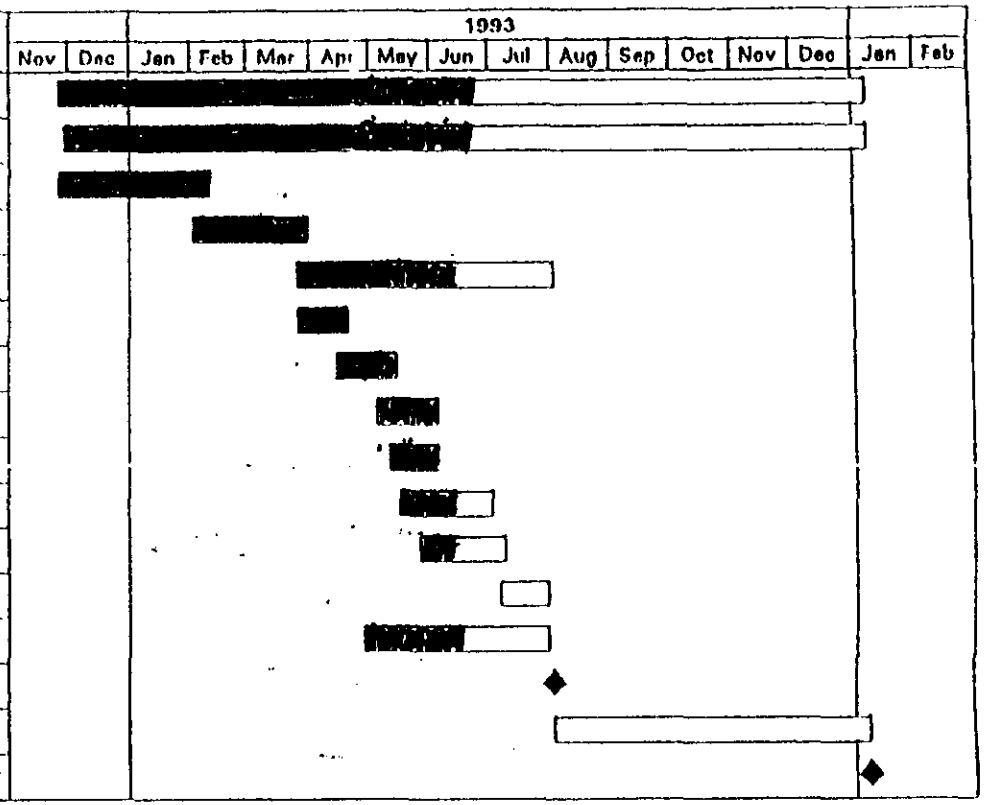
LABORATORY VISIT

- BLDG 324
- 222S LABORATORY
  - Date/Personnel

BIODENITRIFICATION

- TESTS COMPLETED
  - INHIBITION TESTS
  - pH TESTS
  - CARBON RATIOS
  - TEMPERATURE
- TESTS ONGOING
  - CARBON SOURCE
  - LARGE VOLUME DENITRIFICATION
- TESTS COMING UP
  - FINAL CONFIRMATION TEST

ID	Name	Scheduled Start	Scheduled Finish
1	100-HR-3 BIODENITRIFICATION	11/26/92	1/7/94
2	QUALITY ASSURANCE	11/29/92	1/7/94
3	PREPARE TEST DOCUMENTS	11/26/92	2/10/93
9	TEST SET UP	2/2/93	3/30/93
16	TESTING	3/25/93	8/2/93
17	Task 3.4.1 InhibitionTests	3/25/93	4/19/93
24	Task 3.4.3 pH Tests	4/14/93	5/14/93
31	Task 3.4.2 Carbon Ratios	5/4/93	6/4/93
38	Task 3.4.4 Temperature	5/11/93	6/4/93
45	Task 3.4.5 Carbon Source	5/16/93	7/2/93
52	Task 3.4.6 Large Volume Denitrification	5/26/93	7/8/93
60	Task 3.4.7 Final Confirmation Tests	7/6/93	7/30/93
68	Data Analysis and Draft Final Report Preparation	4/27/93	7/30/93
69	Submit Draft Report to WHC	8/2/93	8/2/93
70	FINAL REPORT REVIEWS	8/2/93	1/7/94
76	ISSUE FINAL REPORT	1/7/94	1/7/94



Project: 100 Area Biodenitrification
Date: 4/30/93

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

CHROMIUM PRECIPITATION/ION EXCHANGE

- TESTS COMPLETED
  - CHROMIUM PRECIPITATION WITH $FeSO_4$-NaS
  - URANIUM PRECIPITATION WITH Na_2HPO_4
  - CURRENTLY DATA IS BEING ANALYZED
- TESTS ONGOING
  - ION EXCHANGE
    - -- LABORATORY TESTS ARE COMPLETE
    - -- DATA IS 50% ANALYZED
- TESTS COMING UP
  - CONFIMATORY TESTING

Ex-situ Removal of Chromate, Nitrate, & Uranium (VI)

Scheduled work started on April 8, 1993.
Actual setup began January 27, 1993.

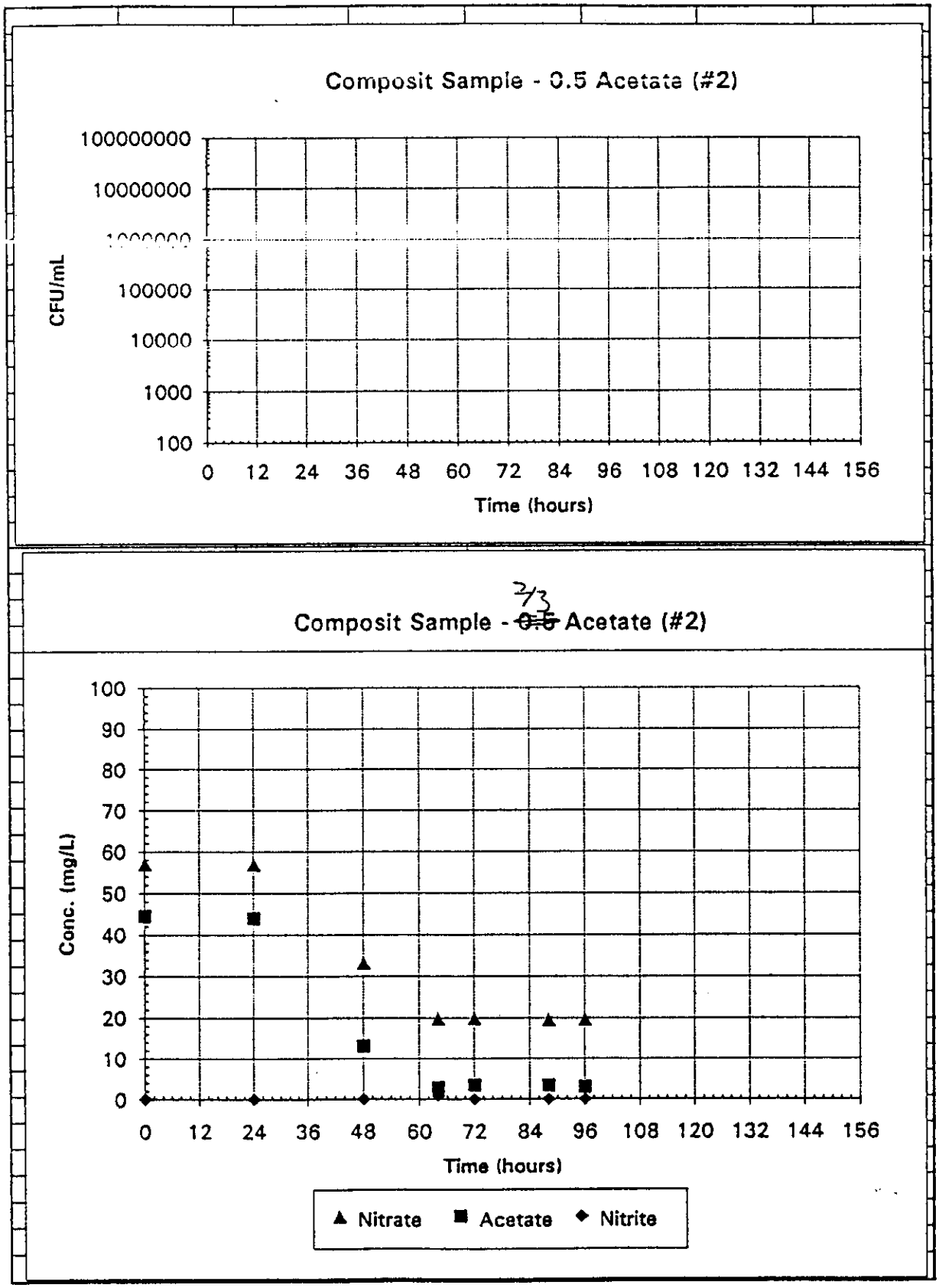
CODE1

1993: 3Feb | 4Mar | 1Apr | 6May | 4Jun | 2Jul | 3Aug | 8Sep | 60ct | 3Nov

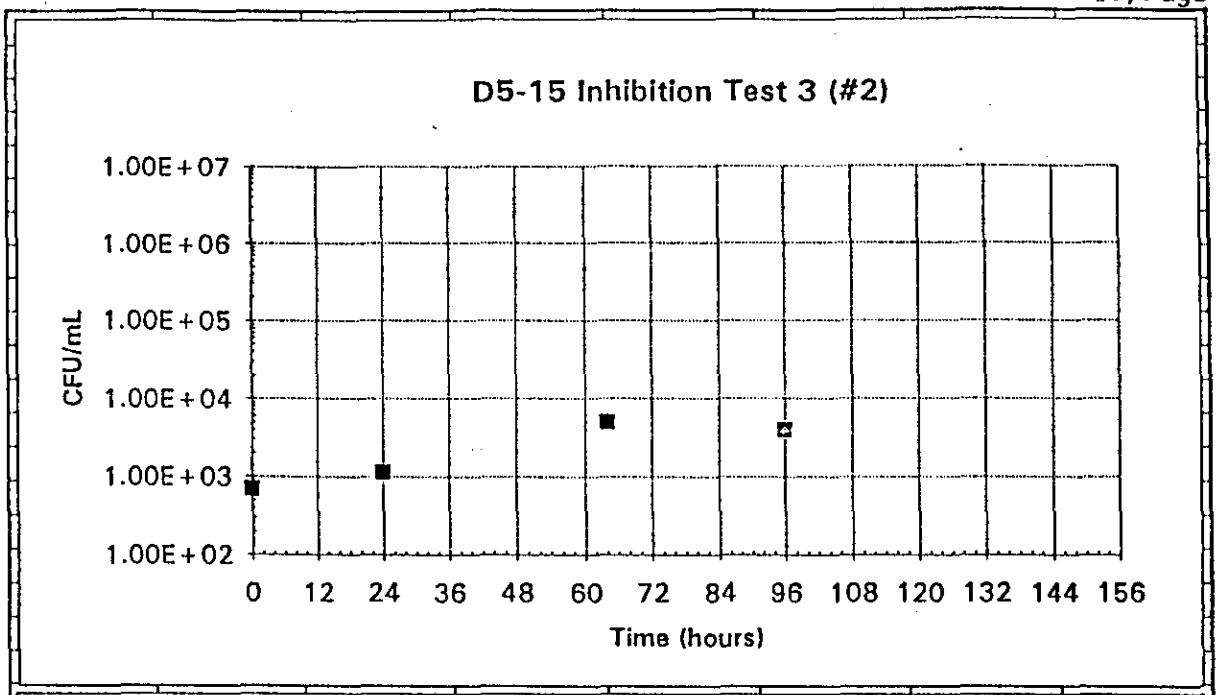
09				
09	GROUNDWATER TREATABILITY TESTS	160.000		12Apr 0 % 29Nov
0901				
0901	PppTn TESTS	95.000		12Apr 0 % 25Aug
090101	SET UP (CENTRIFUGE, PUMPS, AND OTHER APPARATUS)	5.000	M. BECK	12Apr 0 % 16Apr
090102	FeSO4-Na2S	12.000	M. BECK	18Apr 0 % 4May
090103	SET UP (CENTRIFUGE, PUMPS, AND OTHER APPARATUS)	5.000	M. BECK	5May 0 % 11May
090104	Na2HPO4	15.000	M. BECK	12May 0 % 2Jun
090105	ANALYSIS (U, Cr, NO3)	40.000	T. DALE	18Apr 0 % 14Jun
090106	KINETIC STUDY/CONFIRMATORY TESTS	33.000	M. BECK	15Jun 0 % 2Aug
090107	ANALYSIS (U, Cr, NO3)	17.000	T. DALE	3Aug 0 % 25Aug
0902				
0902	ANION TESTS	160.000		12Apr 0 % 29Nov
090201	SET UP (CENTRIFUGE, PUMPS, AND OTHER APPARATUS)	19.000	M. BECK	12Apr 0 % 6May
090202	CONTACTING TESTS	20.000	M. BECK	7May 0 % 4Jun
090203	ANALYSIS (U, Cr, NO3)	25.000	T. DALE	7May 0 % 11Jun
090204	BREAKTHROUGH/CONFIRMATORY TESTS	25.000	M. BECK	14Jun 0 % 20Jul
090205	CYCLING TESTS	21.000	M. BECK	21Jul 0 % 18Aug
090207	ANALYSIS (U, Cr, NO3)	61.000	T. DALE	14Jun 0 % 9Sep
090208	WRITE REPORT	64.000	M. BECK	26Aug 0 % 24Nov
090209	ISSUE REPORT	1.000	M. BECK	29Nov 0 % 29Nov

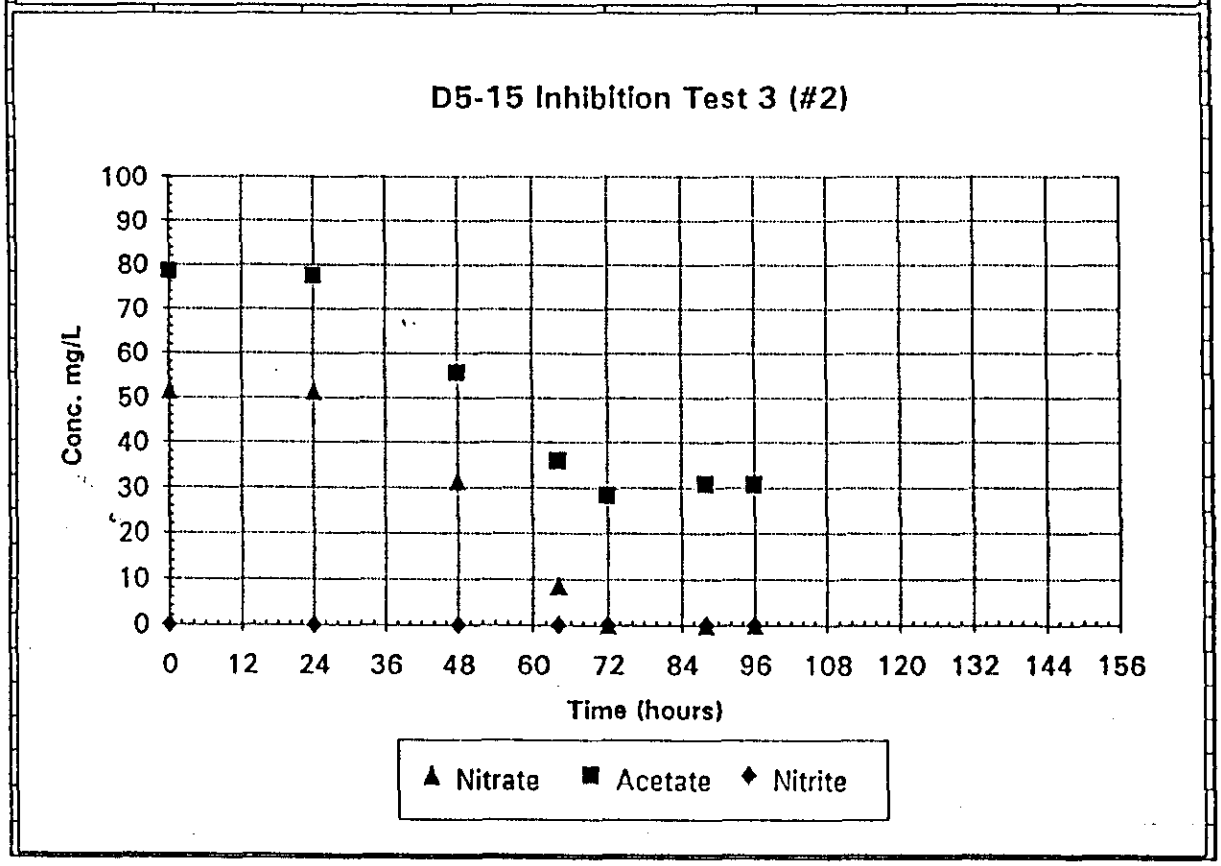
Legend: Early CPM

Project: GWTT	GWTT	Date: 9Apr93 11:52
GROUNDWATER TREATABILITY TESTS		
Page: 1	Drawn by QWIKNET Graphics	

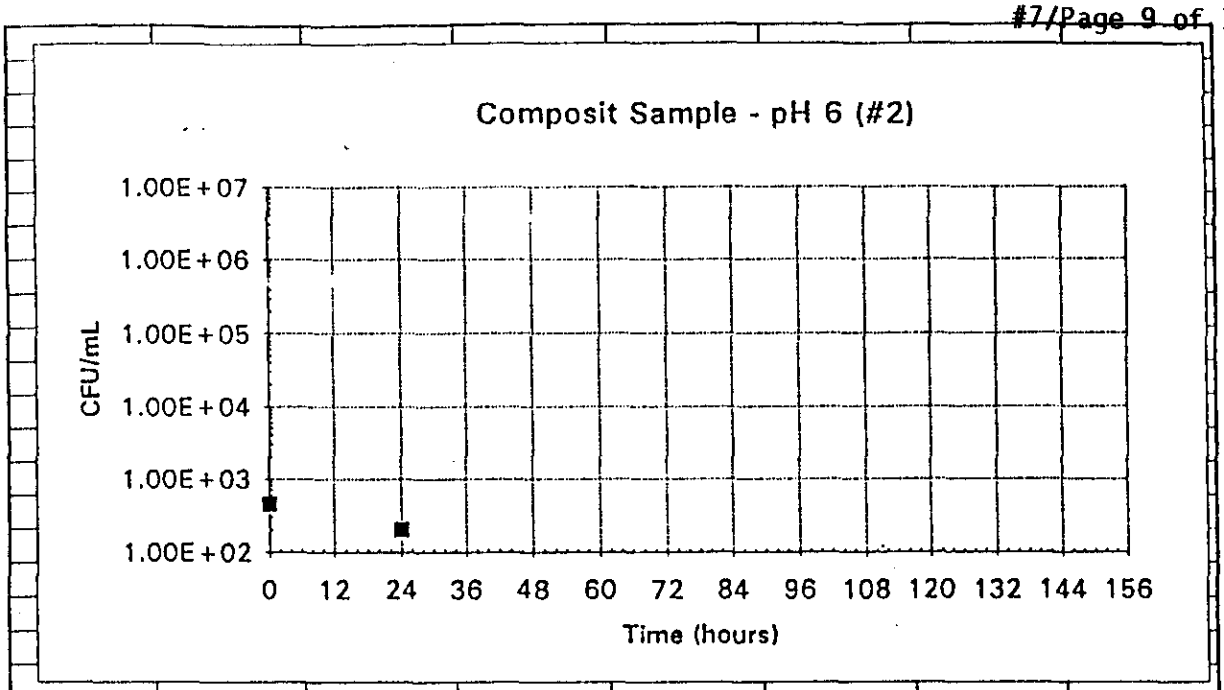


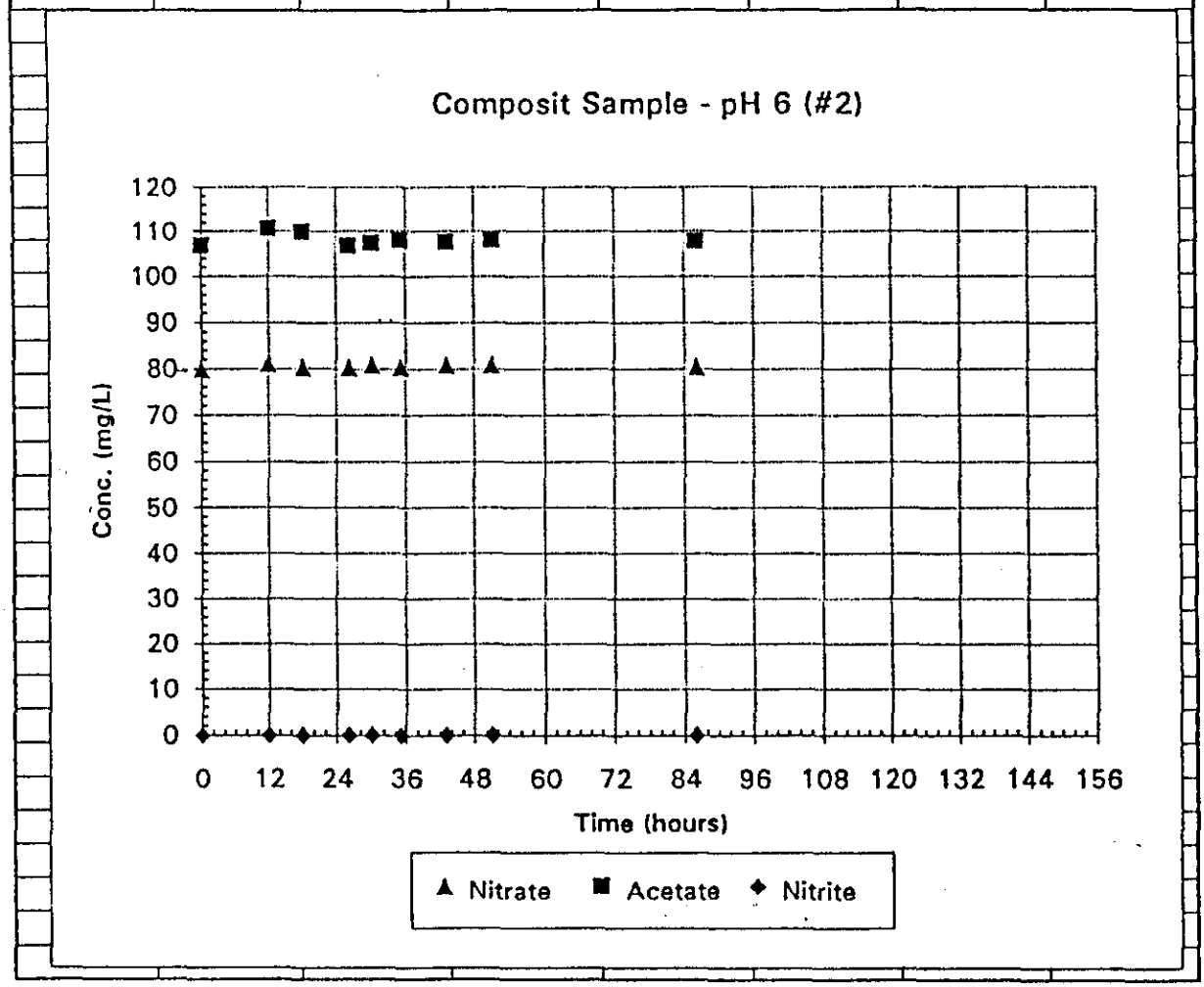
ATTACHMENT 5



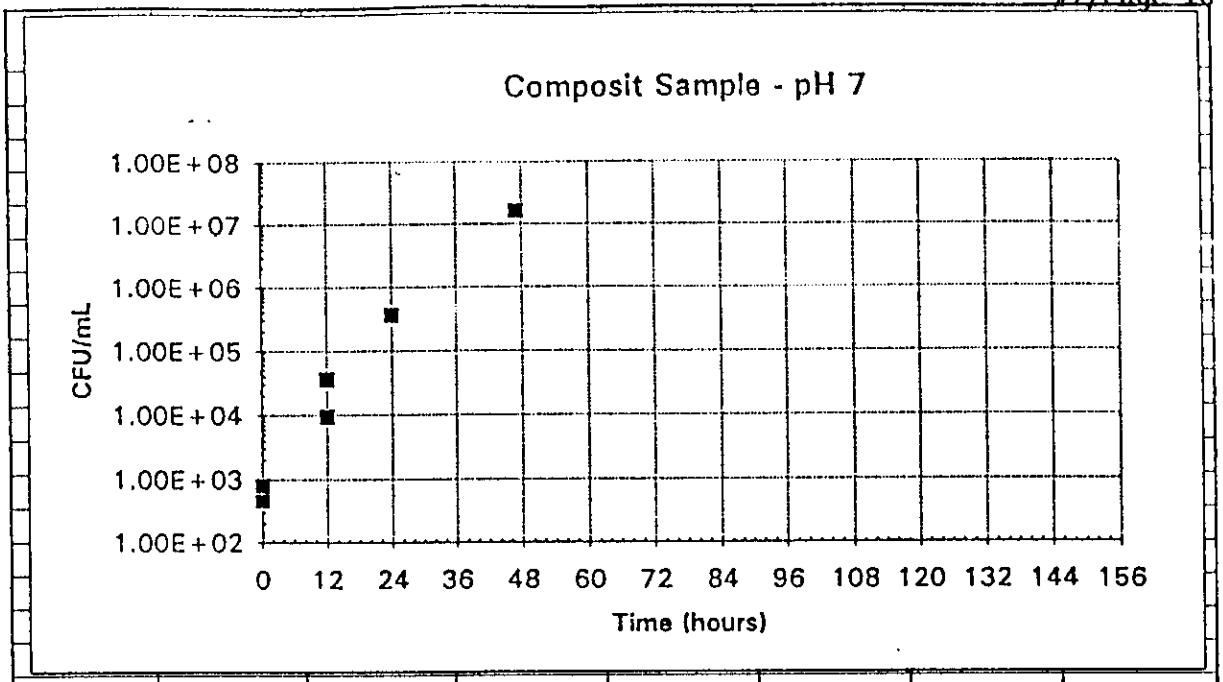


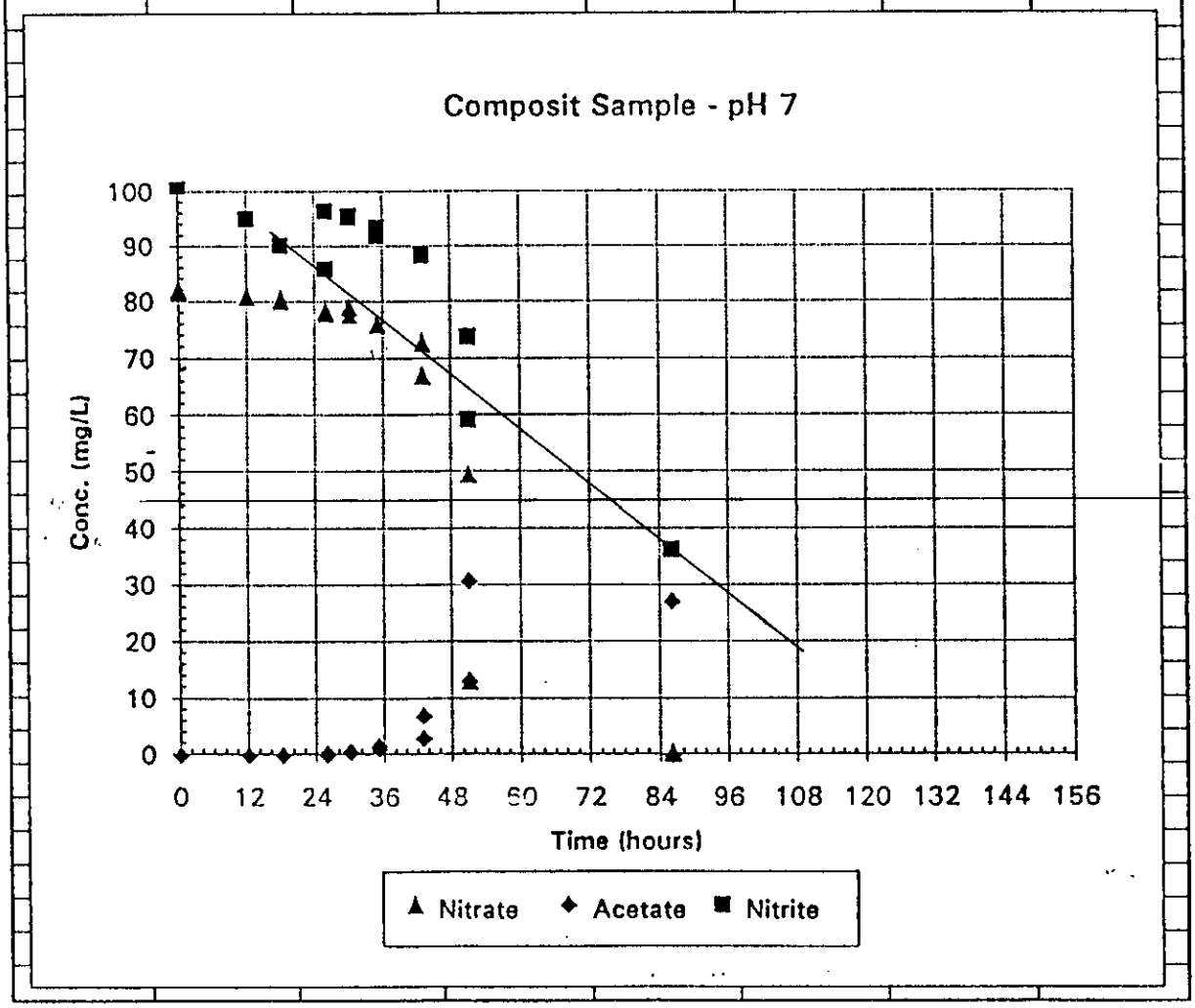
ATTACHMENT 4





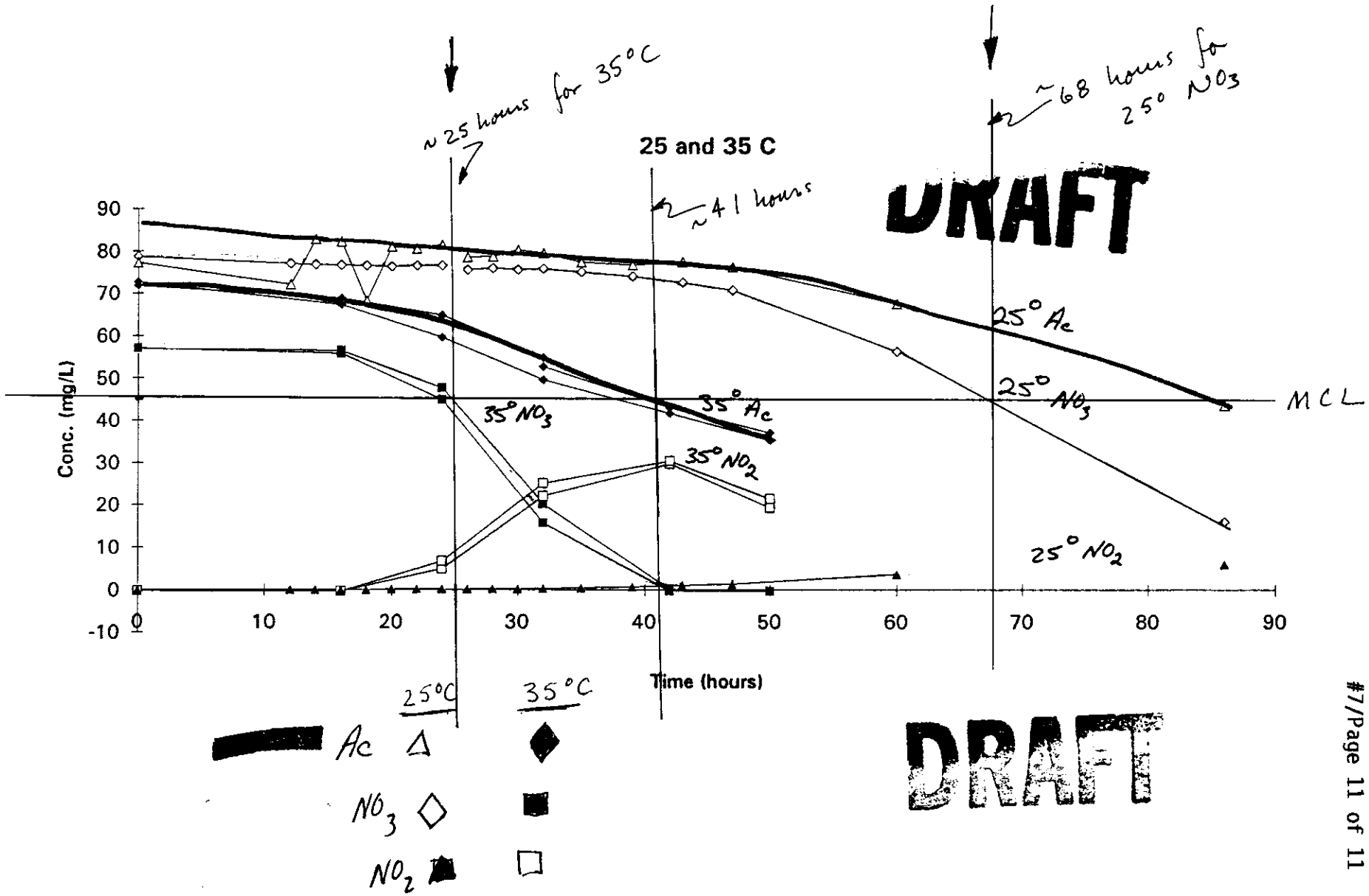
ATTACHMENT 8





ATTACHMENT 7

25&35DEG.XLS Chart 2



100 Area Groundwater Treatability Study

Brent M. Peyton

Pacific Northwest Laboratory

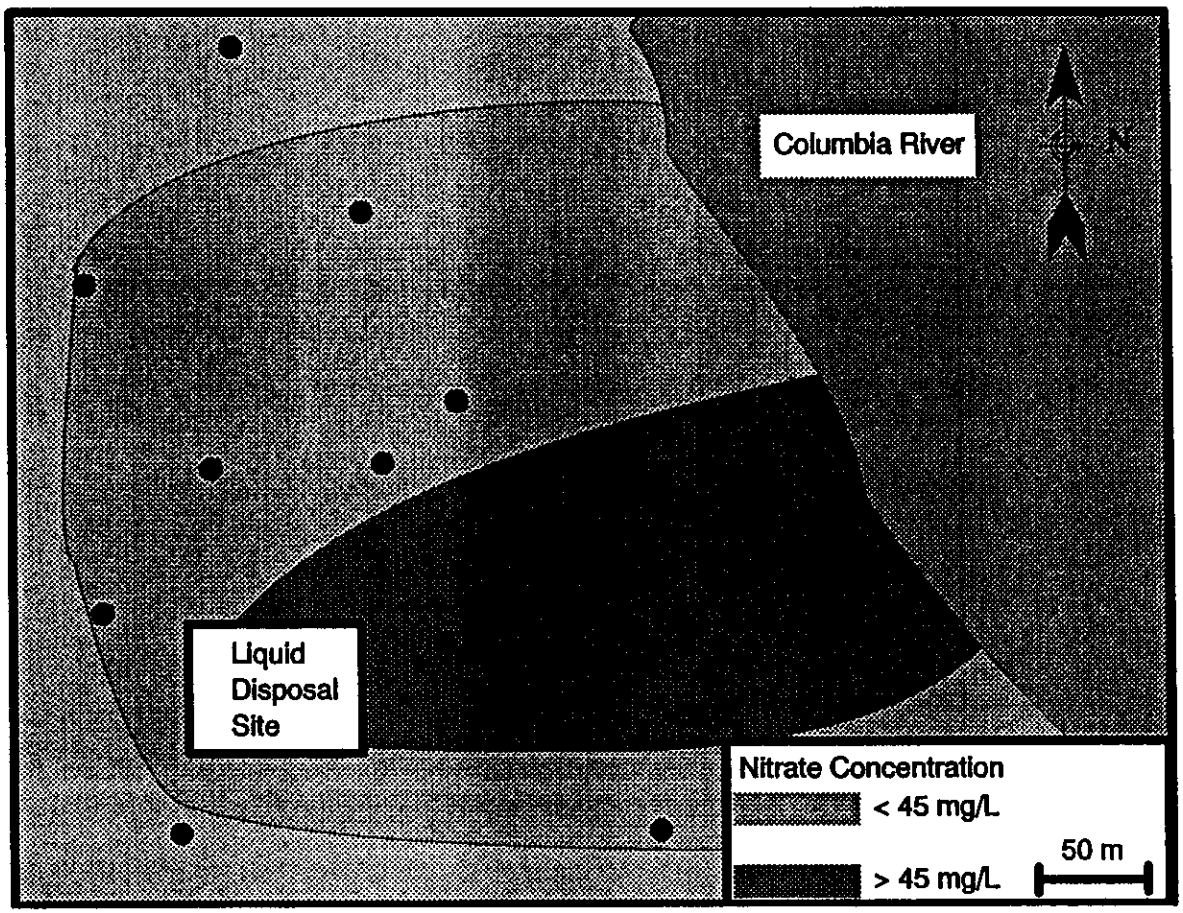
Overview

- Contamination as a result of plutionium production
- Bench Scale
- Data to Aid in Pilot-Scale Design

Background

· Nitrate	· 110 mg/L	(45 mg/L)
· Chromium	· 2000 ppb	(100 ppb)
· Radionuclides		
· Gross Alpha	· 15 pCi/L	(15pCi/L)
· Gross Beta	· 100 pCi/L	(40pCi/L)

100-H Area Nitrate Plume



Pacific Northwest Laboratory

Test Parameters

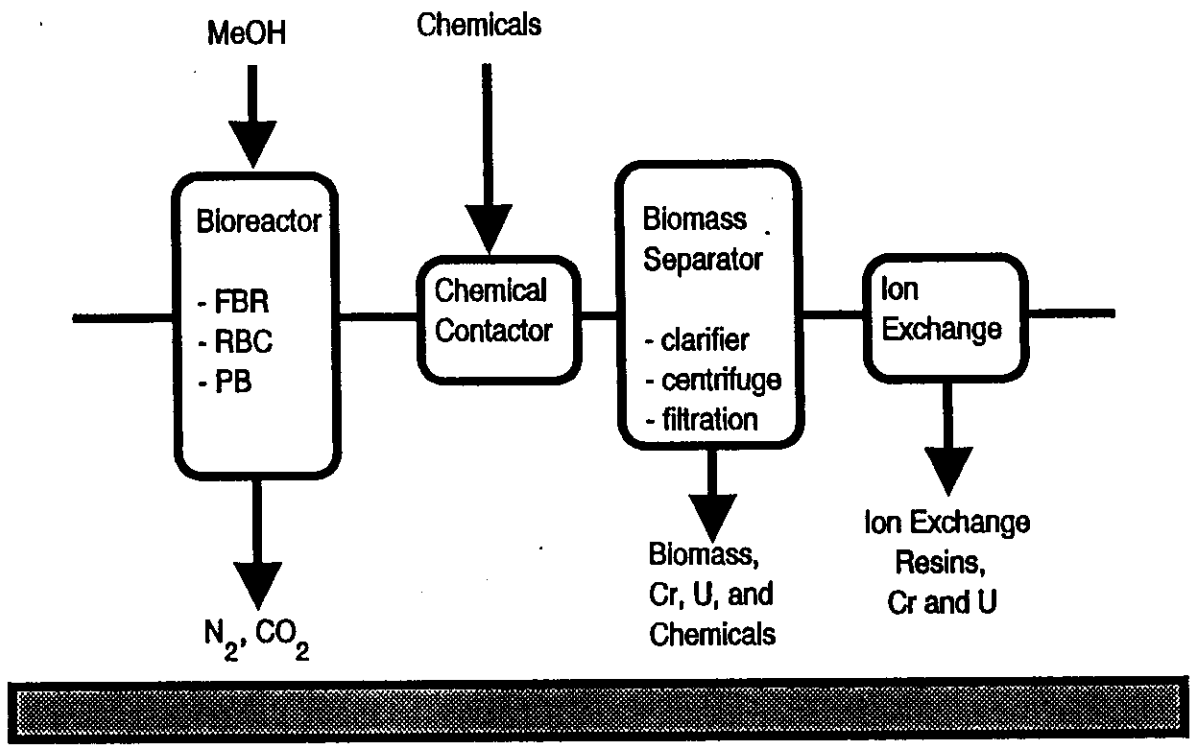
- Presence of Inhibitory Compounds
- Phosphorous Limitations
- Temperature and pH Effects
- Carbon Source
- Radionuclide Adsorption

Test Equipment

- Anaerobic Shake Flasks (500 mL)
  - Modified Hungate opening
- Environmental Shaker
- Ion Chromatograph
- Gas Chromatograph

GENERIC

Pilot Scale Treatment Process



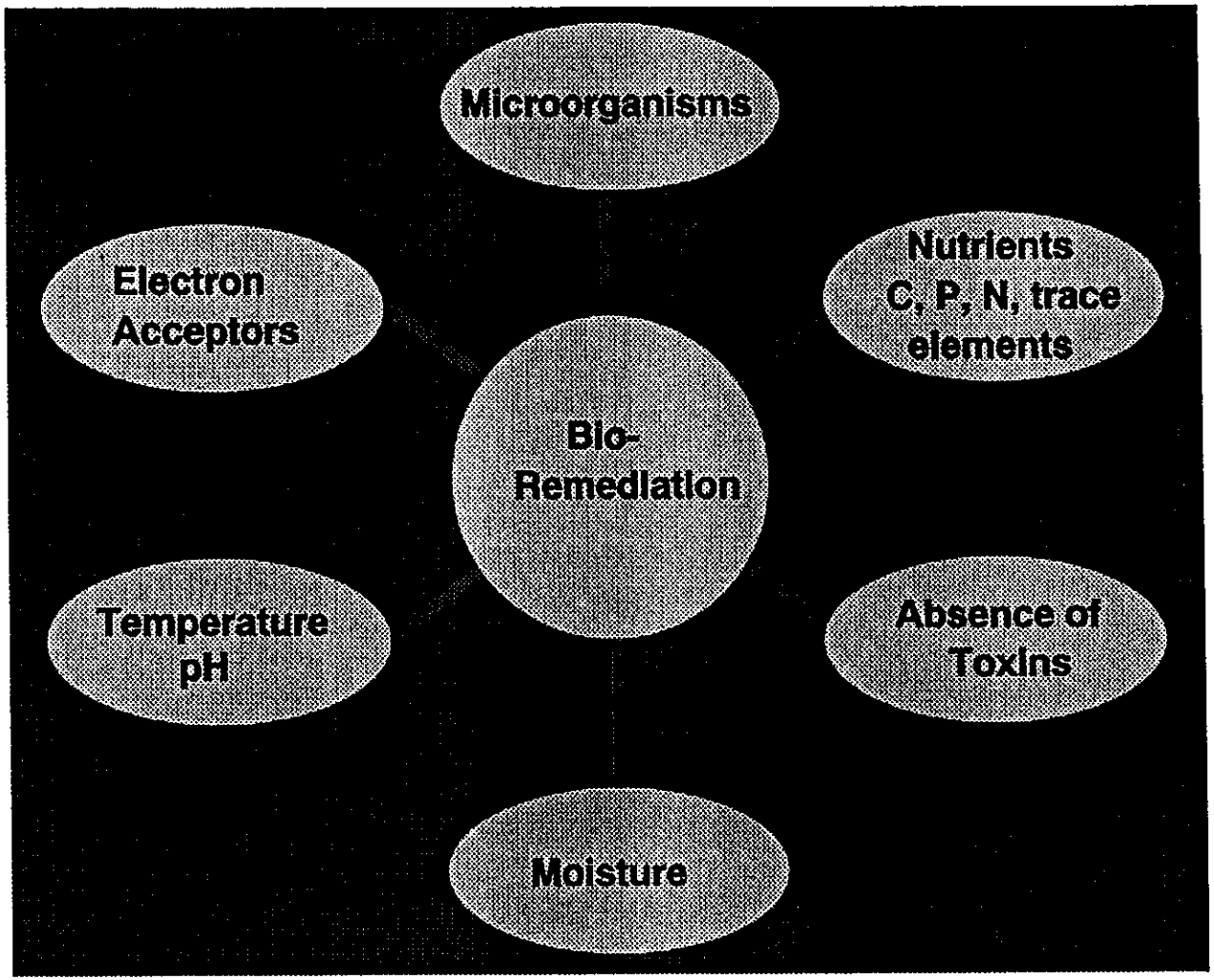
Pacific Northwest Laboratory

Waste Technology Center
Bioremediation Group Experience

Contaminant	In Situ		Ex Situ	
	Saturated Soils	Unsaturated Soils	Aqueous Media	Solid Media
Hydrocarbons	✖	✖	✖	✖
Chlorinated Solvents	✖	✖	✖	✖
Metals			✖	
Nitrates	✖	✖	✖	✖

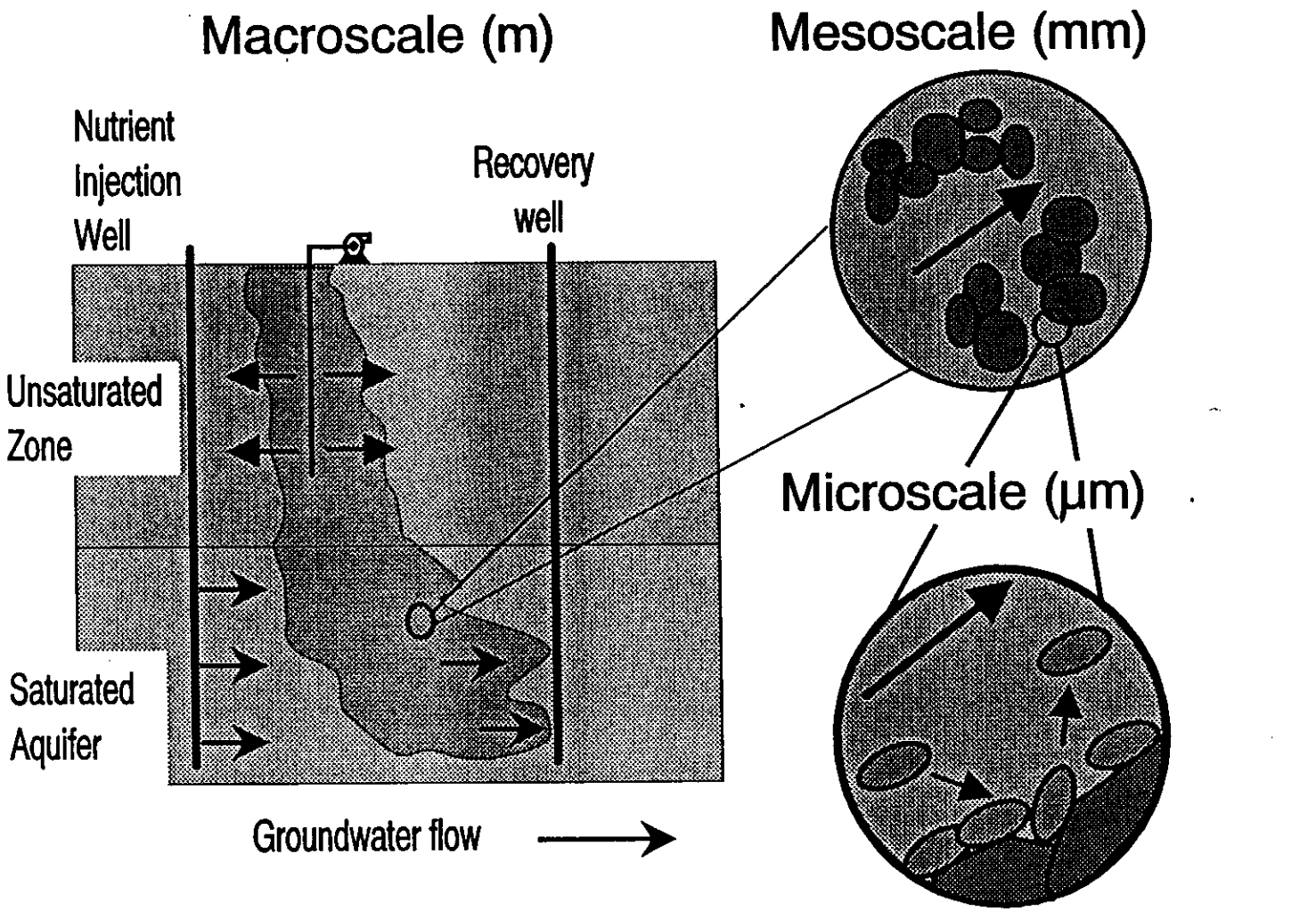
Pacific Northwest Laboratory

Requirements for Bioremediation



Pacific Northwest Laboratory

Scales of Observation



Pacific Northwest Laboratory

Battelle
. . . Putting Technology To Work

Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99352

BRENT M. PEYTON, Ph.D.
Senior Research Engineer
Waste Technology Center
(509) 376-0537 Facsimile (509) 376-1867

222-S LABORATORY COMPLEX ENTRY REQUIREMENTS

As a visitor to the 222-S Laboratory Complex, we welcome you and will try to make your visit as enjoyable as possible. Provided below are the basic requirements for entering and/or working within radiologically controlled areas of the 222-S Laboratory and associated facilities (219-S, 222-SB, 222-SC, and other areas designated with radiological postings).

Dosimetry: A multi-purpose dosimeter (5-chip) is required prior to entering the radiological areas in the Complex. A Personal Nuclear Accident Dosimeter (PNAD) is not required.

Whole Body Count: A whole body count is not normally required for entry into the 222-S facilities. However, some Radiation Work Permits (RWPs) do specify that a whole body count is mandatory. All Department of Energy visitors are required to have a whole body count. Your host will inform you if one is required.

Training (Contractor): If the minimum Radiation Worker Requirements (attached table) are not met, a qualified Laboratory employee must escort you at all times. If you have not been trained in self-survey (both alpha and beta/gamma), a Health Physics Technician must survey you across any and all step off pads.

Training (Offsite): Visitor/Vendor training is required of offsite visitors. In addition, all the forms required by the Westinghouse Radiation Protection manual, Section 7.0, must be completed. These forms include the "Health Physics Entry Requirements Checklist for Non-WHC Personnel," "Visitor Radiation Exposure Disclosure," and a "Medical Disclosure." These are provided during the security badging process. The completed entry requirements checklist should be presented when preparing to enter radiological areas. A qualified Laboratory employee must escort you at all times and a Health Physics Technician will survey you across any and all step off pads.

Those visitors who desire unescorted access must complete the same training required of WHC employees.

Log Books: A "Visitors Log Book" is located in the Laboratory's lobby. All non 222-S Complex employees shall sign this book upon entry and exit.

All personnel, except assigned shift personnel, shall sign the log book on off-shifts, weekends, and holidays when working/visiting any of the buildings within the Complex. The on-duty shift manager shall be advised of your presence. To use the PAX system (the dark brown phones), dial 990 and page the shift manager.

Dress Requirements: The proper dress requirements for a visitor are outlined in the applicable Radiation Work Permit (RWP). A copy of the RWP will be provided for you to read and understand. Safety glasses are required for entry into the individual laboratories.

N/A

Hazardous Waste Training: Hazardous Waste Training is required if you are going to work with any hazardous waste while at the Complex. Your host will inform you if you will need this training. Hazardous Waste Operations (24-hr course meeting OSHA requirements) is required if you plan on entering 219-S, our Treatment, Storage, and Disposal facility. Please contact the manager of the Hazardous Material Unit prior to entering any hazardous waste collection area.

Emergencies: Signs are posted throughout the Laboratory explaining the emergency signals that you may hear while visiting.

The appropriate building evacuation routes and the staging areas will also be explained to you. Maps of the main floor of the 222-S Laboratory with the evacuation routes designated are posted as well.

The Building Emergency Director is the Facility Operations Manager. His alternate is the on-duty shift manager. These people can be contacted using the PAX system (Dial 990 and request that they call the PAX number you are at).

Please remember that these requirements ensure everyone's safety. If you have a concern, comment, or question, please bring it to your escort, the shift manager, or facility operations manager.

We hope your visit to the 222-S Laboratory Complex will be as productive as possible.

R. P. Marshall, Jr., Manager
222-S Facility Operations

- No Polyester material as it captures Radon and will give a positive reform.
- Have Picture Bagde and 5 chip dosimeter

If interested in visit — call Jim Duncan 372-0896

NO CAMERAS

Control Number	100 NPL Agreement/Change Control Form	Date Submitted
51	Change X Agreement Information Operable Unit(s) 100-HR-1 OU	5/7/93 Date Approved 06-23-93

Document Number & Title:	Date Document Last Issued
100 Area Excavation Treatability Test Plan DOE/RL-93-04, Revision 0	N/A

Originator	Phone
J. G. Woolard	6-2539

Summary Description

Meetings were held on 4/12/93, 4/27/93, 5/7/93, 5/19/93, and 5/25/93 in order to resolve comments received on the 100 Area Excavation Treatability Test Plan. The working group consisted of representatives from WHC, MACTC, and the Tri-Parties: Joan Woolard, Linda Bergmann, Jil Frain, Bob Henckel, Jim Patterson (WHC); Eric Goller(RL); Bob Scheck (MACTC); Dennis Faulk, Pam Innis, Paul Beaver (EPA); Rich Hibbard, Ted Wooley, and Jack Donnelly (Ecology). There are three attachments to this agreement form, 1) justification and impact of change, 2) resolution of issues raised in a letter from Ecology dated 4/22/93 and 3) resolution of comments received from EPA and Ecology. Signatures represent agreement with the attachments and approval of the excavation treatability work scope identified in the Excavation Treatability Test Plan and the attachments to this form.

Justification and Impact of Change

See Attachment 1.

WHC Operable Unit Coordinator	Date 6/15/93
DOE Unit Manager	Date 6/16/93
Ecology Unit Manager	Date 6/16/93
Env. Protection Agency Unit Manager	Date 6-17-93

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

ATTACHMENT 1

Justification

Agreements reached herein resulted from negotiations to resolve comments on the 100 Area Excavation Treatability Test Plan.

Impact of Change

The 116-F-4 excavated soil will be the material utilized in the 100-DR-1 Pilot Scale Soil Washing Unit (see attachment 2). This will not preclude using soils from the BC/DR sites for the pilot scale test. Selection of the soils to be utilized in the pilot scale test will be based on the results of the ongoing lab/bench scale soil washing tests.

An additional interim milestone for completion of the 100-HR-1 Operable Unit treatability test will be established to include all field activities associated with the vitrification of the fines from soil washing, or treatment of soil, should soil washing be inappropriate (see attachment 2). The milestone will also address the duration of storage of the excavated soil in the TerraStor™.

Treatability tests conducted to meet the 100-HR-1 milestones will not be required to be repeated to meet future treatability study milestones associated with new 100 Area Operable Unit work plans.

ATTACHMENT 2

The following documents agreements reached on the April 22, 1993 letter received from Ecology:

1. The Excavation Treatability Test Plan will be revised to add that four field screening samples will be taken for chemicals. If these samples indicate the presence of chemical contamination, verification samples will be sent to the lab.

2. The Excavation Treatability Test Plan will be revised to state that field screening for chromium was tested during the Sodium Dichromate ERA and that the results will be presented in the excavation treatability study test plan report.

3. The 116-F-4 Crib is the site selected to conduct the Excavation Treatability Test to meet the 100-HR-1 treatability milestone. The intent of the milestone will be met by completion of field activities. **(See item 1 of attachment 2a flow diagram).**

4. The soil excavated from the 116-F-4 Crib will be stored in a TerraStor™. The following factors will be considered in determining the storage duration: 1) condition of the TerraStor™, 2) the schedule to be established for future treatability tests of this soil, and 3) the schedule for the Record of Decision for the Operable Unit. Storage time will begin with initial placement of excavated material into the TerraStor™. **(See item 2 of attachment 2a flow diagram)**

5. The excavated soil stored in the TerraStor™ will be the material utilized in the pilot scale soil washing test, designated to meet the 100-DR-1 Work Plan milestone (see 100 NPL Agreement/Change Control Form #35), if a soil washing pilot study is a viable option. **(See item 3 of attachment 2a flow diagram).** This will not preclude using soils from the BC/DR Sites for the pilot scale test. Selection of the soils to be utilized in the pilot scale test will be based on the results of the ongoing lab/bench scale soil washing tests.

6. If the stockpiled soil is not suitable for soil washing and the pilot scale soil washing test is not conducted, an alternate treatability test (i.e., vitrification, stabilization with additives, or other test) and/or final disposal action will be performed. **(See item 4 of attachment 2a flow diagram).**

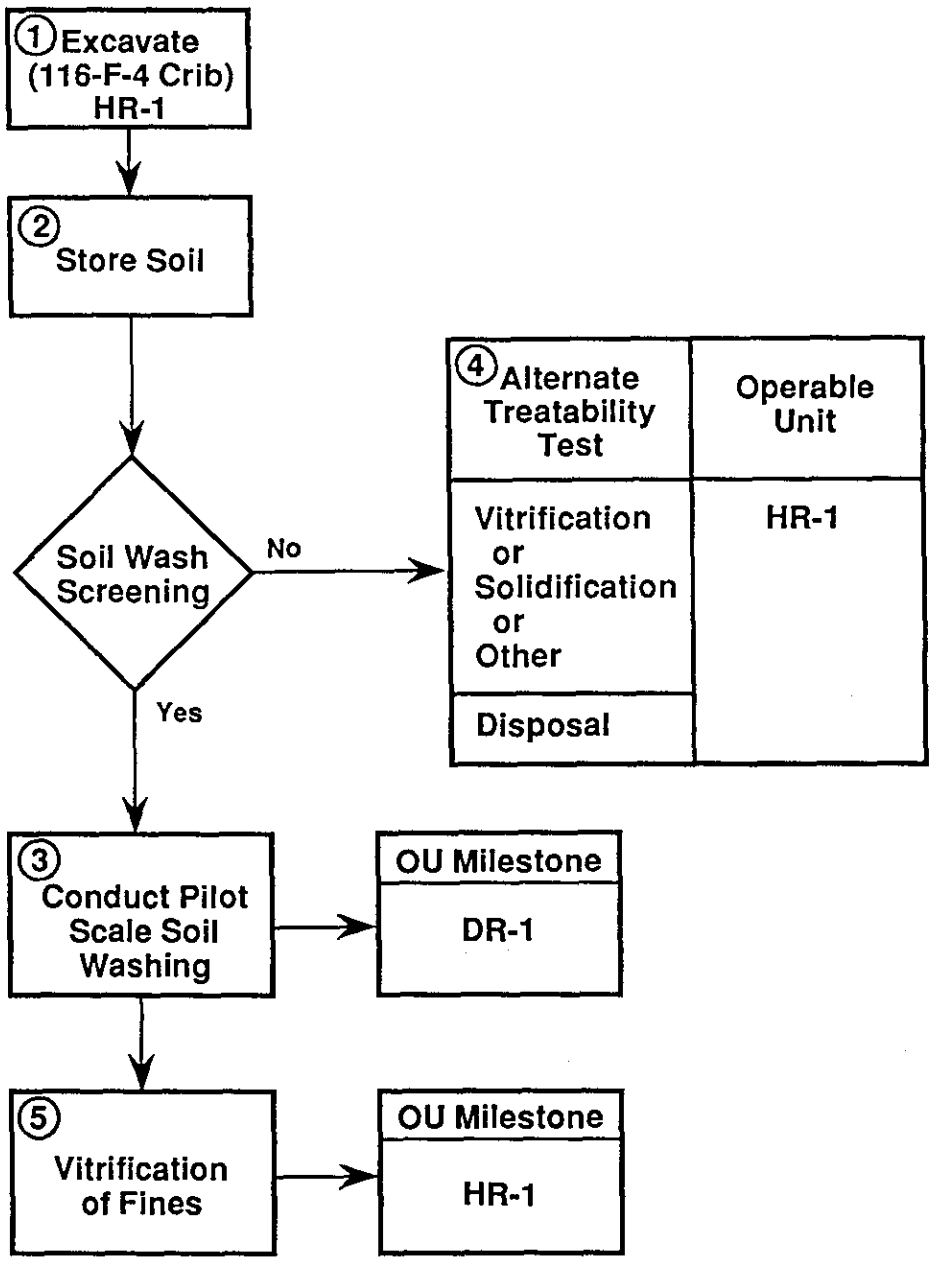
7. The residual contaminated fraction from the soil washing test (soil washing fines) will be utilized in a vitrification treatability test. **(See item 5 of attachment 2a flow diagram).**

8. An interim milestone(s) will be established for the 100-HR-1 Operable Unit, which will address items 4, 6, and 7 above.

9. Water leachability tests will be conducted on the contaminated fraction of soil generated during the soil washing pilot test. This will be incorporated into the test plan for conducting the soil washing test.

Attachment 2a

Treatability Study Flow Diagram



ATTACHMENT 3

RESPONSE TO ECOLOGY COMMENTS ON THE 100 AREA EXCAVATION TREATABILITY TEST PLAN DOE/RL-93-04, DECISIONAL DRAFT

1. General Comment:

Deficiency: Apparently there was not a meeting of the minds with respect to the contents and purpose of this treatability test. Ecology expects the results of this treatability test could be used to support or disprove the ability of the three parties to perform the observational approach at Hanford. Ecology, is therefore, concerned that this test does not evaluate inorganic and organic chemicals.

Ecology expected that the dust suppression portion of this test could be used to evaluate multiple alternatives. The use of water as a dust suppressant should be discouraged due to the potential introduction of a driving force for contaminant mobility. This report identified the use of foams and wind breaks as potential dust suppression technologies, however their evaluation was not within the scope of this test.

Recommendation: Reevaluate the location of the proposed test. The new location need not be a small site, in fact it is preferred that the test be performed on a portion of a large liquid waste disposal site. If at all possible, the site should be located in the 100-H, 100-D, or 100-N Areas. Also, reevaluate the potential dust suppression technologies and include, at a minimum, the foam test at this unit.

Response: **As discussed in the meeting held on April 1, 1993 with DOE, EPA and Ecology, field screening for contamination other than radionuclides will tested as part of the over all field screening tests being conducted currently at characterization sites. Field screening for chromium is currently being tested at the Sodium Dichromate ERA site, and other characterization sites have tested XRF for metals.**

The section of the text pertaining to dust control will be revised to fully define the test parameters. The INEL "contamination control unit" will be brought to the site for this purpose.

2. General:

Deficiency: The intent of the 100-HR-1 Interim Milestone is not clear.

Recommendation: Ecology recommends we discuss the minimum amount of work necessary to fulfill this milestone at the comment disposition meeting.

Response: **Milestone will be reached with the completion of field excavation activities.**

3. General:

Deficiency: The field screening equipment (Level I) must be verified. Without adequate comparison to mobile laboratory and laboratory analysis Level II and III respectfully, the results of the test cannot be verified.

Recommendation: Ecology recommends that split sampling be performed and that 50 percent of the Level I samples also be subjected to Level II analysis and that 10 percent of the Level I samples be subjected to Level III analysis.

Response: The number of samples taken during each lift and those being sent for laboratory analysis will be added to the text. There will be sixteen samples per lift (level B analysis) over ten lifts, and 20 of the resulting (192) samples will be sent for confirmatory laboratory analysis. This is 10.4% of the level B samples. One hundred percent of the level C samples will also be analyzed by the germanium detector (level B). This will be clarified in the text.

4. Section 1.2, Page 1:

Deficiency: The reason for evaluating multiple dust suppression technologies is not clear. For example, if inhalation by workers is the prime concern, then respirators should be evaluated. If redistribution of contaminated dust particles is the prime concern, then containment structures should be evaluated. If they are equally important then this too should be evaluated.

Recommendation: Revise the text to perform a more comprehensive evaluation/execution of dust suppression technologies.

Response: Both worker safety and minimization of contamination spread are the driving forces behind this study; however, the most effective method of protection of the environment and workers is not necessarily use of respiratory protection or containment shelters. The text will be revised.

5. Section 1.2, Page 2:

Comment: This test plan is not specific on how data management and community relations would be performed.

Recommendation: Revise the text to address this comment.

Response: "Data management" will now read "data handling and reporting". Community relations is addressed in Section 6.0, last paragraph.

6. Section 1.3.1, Page 3:

Deficiency: The parameters for selecting the test site are incomplete.

Recommendation: Revise the text to include the need for evaluating inorganic and organic contaminants.

Response: **See response to comment 1.**

7. Section 1.3.1, Page 3, fourth bullet:

Deficiency: This test no longer is designed to remediate an entire site. Therefore, the requirement to select a site with a relatively small amount of contamination is no longer valid.

Recommendation: Remove this bullet and replace it with the requirement to select a site with organic, inorganic, and radionuclide contamination in sufficient concentrations that they can be measured with Level I field screening equipment.

Response: **Since the material removed from the pit may be stored on site, it is important to minimize volume.**

8. Section 1.3.1, Page 3, last paragraph:

Deficiency: The 116-F-4 pluto crib is not adequate to meet the requirements of this test.

Recommendation: Select another waste site within the 100-H, 100-D, or 100-N Operable Units.

Response: **See response to comments 1 and 2.**

9. Section 1.3.3, Page 5, first paragraph:

Deficiency: The description of chromium contamination in this paragraph is highly biased. Without analytical data to support this hypothesis it is impossible to verify.

Recommendation: Remove this discussion from this work plan.

Response: **The data used in the discussion is based on knowledge of the process, knowledge of the methods used at the time, and the physical characteristics of the soil at the site. The discussion logically discusses whether chromium could exist at levels of concern in the soil at the site, and concludes that it is highly unlikely. This hypothesis will be supported by the preliminary LFI data.**

10. Table 1-1, Page 6:

Comment: Due to the fact that there are no clear performance goals available for this test an easy check would be the comparison to background radionuclide concentrations. Background concentrations should be evaluated when selecting proposed cleanup levels.

Recommendation: Revise this table to include a column for background concentrations.

Response: **The performance goals listed in Table 1-1 have been accepted by DOE, EPA, and Ecology in the two soil washing treatability test plans (DOE/RL-92-51 and DOE/RL-92-21).**

11. Section 2.1, Page 7, second paragraph and Table 2-1:

Deficiency: The meaning of this table is not clear. Is US DOE stating that dust suppression control is not necessary? If so, then Ecology proposes US DOE formally suspend all dust suppression technologies.

Recommendation: Revise the meaning of this table and its supporting text.

Response: **The supporting text will be revised to clearly state the conditions of the LATA study and the conclusions listed in Table 2-1.**

12. Section 2.2.1, Page 10, third paragraph:

Comment: What is the unacceptable moisture content that affects the radionuclide screening capabilities?

Recommendation: Expand this section to address this comment.

Response: **The unacceptable moisture content will vary for each radionuclide and will not be known until this test is performed. The text will be revised accordingly.**

13. Section 3.1.1, Page 16, first paragraph:

Comment: The text should specify that the goal is to assess the minimum amount of water required to reduce dust emissions.

Recommendation: Revise the text to add the word minimum.

Response: **Comment Withdrawn**

14. Table 3-1:

Deficiency: Chapter 173-303 WAC is missing from this table.

Recommendation: Add MTCA to this table.

Response: **MTCA will be added.**

15. Section 3.3, Page 19, first paragraph:

Comment: This section does not address the need for verification sampling.

Recommendation: Revise the text to include verification sampling.

Response: **Since the objective of the test is not to cleanup the site, no verification sampling will be performed.**

16. Section 4.1.1, Page 20, first paragraph:

Deficiency: What is the "contaminated soil storage area"? What is the "contaminated soil staging area"? These terms need to be defined.

Recommendation: This is an improper use of the Investigative Derived Waste Policy (IDW). Any waste generated as a result of this test must leave the Operable Unit. The text should be revised to describe the fate of this waste.

Response: **See response to comment 19.**

17. Section 4.1.3, Page 29, first paragraph:

Comment: The thickness of the plastic sheeting is not given.

Recommendation: Revise the text to state the thickness of the plastic sheeting.

Response: **Thickness of plastic sheeting will be provided in the test procedures.**

18. Section 4.1.6, Page 32:

Deficiency: Ecology disagrees that the fate of the excavated soils lies solely on the extended range germanium detector.

Recommendation: Revise this section to address all forms of contamination. Also include a process to manage the waste that the Level III analysis indicates a problem.

Response: **The fate of the contaminated soil does not rest entirely on the germanium detector. The soil stockpiling provides the necessary delay for analysis of lab results. A minimum of one sample of each spoil pile will be sent to off-site laboratories for chemical analysis.**

19. Section 7.0, Page 36:

Deficiency: The residuals management section is not consistent with previous agreements.

Recommendation: Revise this section to remove all waste from the operable unit.

Response: **The contaminated soil will remain at the site in a modular storage unit as outlined in 100 NPL Agreement/Change Control Form #51.**

20. Section 3.1, Page A-5:

Deficiency: All Level III samples must be linked to field screening results. The process should mirror field splits.

Recommendation: Revise the text to address the sample analysis criteria.

Response: **As stated in the text, all level C analyses are all linked to field screening results. The text will be clarified.**

RESPONSE TO EPA COMMENTS ON THE 100 AREA EXCAVATION TREATABILITY TEST PLAN DOE/RL-93-04, DECISIONAL DRAFT

1. Comment: page 1, paragraph 1.

The Treatability Study Program Plan is an internal DOE document and this should be noted if this reference is going to used.

Response: The Treatability Study Program Plan, Draft A, has been approved for public release. It is however, still in draft format, and this will be noted in the reference section.

2. Comment: page 1, bullets.

The studies being conducted at INEL on excavation practices should be included in this document or if the information is not available at this time a reference should be made that INEL information will be included as appropriate.

Response: Accept, the data from INEL will be reviewed and incorporated where appropriate.

3. Comment: page 1, last paragraph.

This paragraph discusses the purpose and scope of this test plan. In addition to field and laboratory analysis for radionuclides this test must also consider analysis for the other contaminates of concern in the 100 area.(ie metals, VOA's, Semi VOA's, and anions)

Response: As discussed in the meeting held on April 1, 1993 with DOE, EPA and Ecology, field screening for contamination other than radionuclides will tested as part of the over all field screening tests being conducted currently at characterization sites. Field screening for chromium is currently being tested at the Sodium Dichromate ERA site, and other characterization sites have tested XRF for metals. The excavation treatability test will concentrate on the radiation monitoring without adding the complication of chemical monitoring at this time.

4. Comment: page 2, bullets.

A paragraph should be added to this section to describe how the work done under this test will feed into later treatability tests.

Response: The text will be modified to define use of test results.

5. Comment: page 3, middle of page.

This section discusses the site selected for the test. WHC and DOE selected the 116-F-4 crib for the site of the test. EPA does not agree with this location as it does not contain many of the contaminates of concern for the 100 areas. A site or sites must be selected that contain adequate inventories of the major contaminates of concern.

Response: See response to comment 3.

6. Comment: page 7, 2nd paragraph.

This paragraph discusses a VE study conducted by Los Alamos on dust control in the 100 B/C area. This study was done with no regulator involvement. Therefore EPA requests that DOE transmit a copy of the report for our use.

Response: Accept, Westinghouse will provide a copy of the report.

7. Comment: page 6, last paragraph.

This section discusses dust control. The technologies presented in this section appear to be well proven and therefore unnecessary. Additional rational should be provided on why these technologies were chosen while excluding others.

Response: The objective of a treatability test is to generate site specific effectiveness and cost information. While dust suppression is a well established technology, it has never been demonstrated at 100 Area waste sites. The rationale for exclusion of other technologies will be added to the text.

8. Comment: page 8, 3rd paragraph.

No rational is given why the mobile lab is not being utilized for this test. EPA recommends that this test plan be revised to include the use of the mobile lab.

Response: The main intent of this test is to correlate the field screening for radionuclides with laboratory results. The procurement schedule does not support this treatability study, therefore, it cannot be added to the scope of this study.

9. Comment: page 28, 1st paragraph.

This paragraph discusses the depth of the excavation. A statement is made that if 2 lifts in a row are clean the excavation will be terminated. Records show that in some waste sites the contamination is found in lenses, therefore, by terminating after 2 lifts there is a possibility that contamination could be left in place.

Response: The intent of the test is not to clean a site but to provide dust control analysis and correlation between field and laboratory instruments. The test will proceed to the bottom of the crib then continue until 2 clean lifts (2 to 4 ft of clean soil) have been excavated or to a depth of 25 ft below land surface. This will be clarified in the text. Also, the text will be revised to state that local changes in soil type should be analyzed using one or more of the discretionary samples.

10. Comment: appendix A.

This section should discuss the effects of changing climatic conditions on the various aspects of the test.

Response: The text will be revised to include a discussion of the mechanics of dust control.

Control Number	100 NPL Agreement/Change Control Form	Date Submitted
53	Change X Agreement Information Operable Unit(s) 100-HR-1 OU	6/9/93 Date Approved 06-23-93

Document Number & Title:	Date Document Last Issued
100 Area Excavation Treatability Test Plan DOE/RL-93-04, Revision 0	N/A

Originator	Phone
J. G. Woolard	6-2539

Summary Description

The following agreement, along with the agreement reached in the 100 NPL Agreement Form #51, documents the resolution of issues concerning the 100 Area Excavation Treatability Test raised by Ecology in a letter dated April 22, 1993. See attached page for description.

Justification and Impact of Change

The agreement reached herein resulted from negotiations to resolve comments on the 100 Area Excavation Treatability Test Plan. The agreement will allow for a logical progression of treatability testing activities, building on information gained from the current excavation test activities and soil washing activities.

This agreement defines the methodology and timeframe for defining additional treatability tests and treatability milestones for the 100-HR-1 Operable Unit.

WHC Operable Unit Coordinator	Date 6/10/93
DOE Unit Manager	Date 6/10/93
Ecology Unit Manager	Date 6/23/93

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

Attachment

Description of Agreement

Additional soil treatability tests to meet future 100-HR-1 Operable Unit milestones will be defined based on the information obtained from the current soil washing treatability test program. All the available data from the bench scale soil washing tests of the 100-BC-1, 100-DR-1, and 100-FR-1* soil will be provided informally to the regulatory agencies by November 19, 1993. Within two weeks after providing the bench scale data, RL will present in a working level meeting the following to the regulatory agencies: 1) an interpretation of the data, 2) recommendations on whether to proceed with pilot scale soil washing and/or the appropriate follow-on treatability tests, and 3) a draft schedule for the follow-on 100-HR-1 treatability test activities. Based on this information, the Tri-Parties will establish an interim 100-HR-1 Operable Unit milestone(s) for storage of the soil excavated from the 116-F-4 Crib and for completion of field activities for additional treatability tests as described in 100 NPL Agreement Form #51.

* The 116-F-4 Crib soil will undergo the level of soil washing bench scale testing necessary to confirm whether this material is amenable to soil washing, which may be less testing then that required for the BC/DR soil.

100 NPL Agreement/Change Control Form

Control Number		
48	___ Change _X_ Agreement ___ Information Operable Unit(s) 100-DR-2	Date Submitted: 04-20-93 Date Approved: 06-23-93

Document Number & Title:	Date Document Last Issued:
100-DR-2 Investigation 3 Page Table	N/A

Originator:	Phone:
N.M. Naiknimbalkar	509-376-8739

Summary Description:

The table contains 100-DR-2 sites, waste types, descriptions, characterization strategy, proposed boreholes, and Investigation Approach. The items addressed in the table have been discussed with DOE-RL and Regulators during March 17, 1993 site walk of the 100-DR-2 Operable Unit (See attachment) and have been amended based on discussions held 6/1/93.

Justification and Impact of Change:

N/A

N.M. Naiknimbalkar N M Naiknimbalkar 6/23/93
WHC Operable Unit Coordinator Date

E.D. Goller E. D. Goller 6/23/93
DOE Unit Manager Date

Ted Wooley Ted A Wooley 6/23/93
Lead Regulatory Unit Manager Date

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3.

Table 4-2. 100-DR-2 Investigation (Sheet 1 of 3)

SITE	WASTE/TYPE	COMMENTS	STRATEGY	PROPOSED BOREHOLES	INVESTIGATION APPROACH
HIGH PRIORITY FACILITIES					
116-D-8 (100-D Cask Storage Pad)	CASK STORAGE PAD 34mX26m (110'X86')	Active from 1946-1975. Facility has 2 drainage systems; one for storm water and one for spillage. Spillage was handled by disposal through a french drain. The storage pad was decontaminated by removing portions of the concrete. The concrete chips were reported disposed of in the 200 Areas. Rinse water was disposed of adjacent to the pad in an area currently marked "Underground Radioactive Material".	IRM	0	Identify number and volume of spills that occurred on the pad. Site to include adjacent site posted as underground rad. Geophysics will be used to aid in location of french drain and evaluation of site.
116-DR-3 (105-DR Storage Basin Trench)	TRENCH 18mX12mX3m (60'X40'X10')	The site was active during 1955, received 4,000,000 liters (1,056,688 gal) of contaminated sludge and water from 105-DR fuel storage basin.	LFI/IRM	1	Geophysical survey using GPR or EMI to ascertain the presence and nature of materials used to fill the trench. One vadose zone borehole in a location determined by the geophysical survey.
116-DR-4 (105-DR Pluto Crib)	PLUTO CRIB 3mX3mX5m (10'X10'X15')	116-DR-4 was active from 1952-1953, and received 4,000 liters (1,057 gal) of liquid wastes from isolated tubes containing ruptured fuel elements in the 105-DR fuel storage basin.	IRM	0	No LFI activity is planned for this facility as it is analogous to other pluto cribs.
116-DR-6 (1608-DR Liquid Disposal Trench)	TRENCH 15mX3mX3m (50'X10'X10')	The site was active from 1953-1965, received 7,000,000 liters (1,849,204 gal) of diverted coolant during the Ball 3X upgrade. It also received diverted water during reactor shutdown.	LFI	0	LFI will be limited to correctly locating the trench.
116-DR-7 (105-DR Inkwell Crib)	POTASSIUM BORATE DISPOSAL CRIB 1.5mX1.5mX3m (5'X5'X10')	The site was active during 1953, received 4,000 liters (1,057 gal) of liquid potassium borate from the 3X system prior to the Ball 3X system upgrade. There is reason to believe the site may be a storage tank rather than a crib.	LFI/IRM	1	LFI should consist of geophysical surveys to determine if the facility is a crib of a storage tank. If surveys indicates facility is a crib then a single borehole should be drilled to characterize the crib.

Table 4-2. 100-DR-2 Investigation (Sheet 2 of 3)

SITE	WASTE/TYPE	COMMENTS	STRATEGY	PROPOSED BOREHOLES	INVESTIGATION APPROACH
116-DR-8 (117-DR Crib)	SODIUM FIRE FACILITY OPERATIONS CRIB 3mX3mX3m (10'X10'X10')	The site was active from 1960-1964, received 240,000 liters (63,401 gal) of drainage from the containment system 117 Building seal pits.	LFI/IRM	0	Research/identify waste(s) that were placed in crib. Determine if waste(s) exhibit extraordinary contamination problems; should this be the case, further field investigations will be implemented.
132-DR-1 (1608-DR Waste Water Pumping Station)	PUMPING STATION (low level liquid waste) 11mX10m (36'X34')	The site was active from 1950-1964, received low level liquid waste. Unit consisted of an above ground structure and a below grade structure.	LFI	0	Research WIDS specific files to determine if any leaks occurred at this facility, if leads occurred determine volume, number, etc.
Sodium Dichromate Tanker Car Off-Loading Facility	SODIUM DICHROMATE TRANSFER STATION ADJACENT FRENCH DRAIN	Possibly a major source of contamination. Located north of the railroad tracks on the northern boundary of the OU.	LFI/IRM	1	Vadose zone boring through french drain to ascertain the distribution and quantity of Sodium Dichromate in the vadose zone.
SOLID WASTE BURIAL GROUNDS					
118-D-5 (Ball 3x Burial Ground)	(2) TRENCHES 12mX6mX3m (40'X20'X10') each	Site was active during 1954, received 10 cubic meters (353 feet^3) of thimbles removed from the 105-DR reactor during Ball 3X work.	LFI	0	Locate using geophysical methods.
126-DR-1 (190-DR Clearwell Tank Pit)	CLEARWELL TANK PIT 13mX160m (42'X525')	The site has been active since 1970's as a landfill. The waste is non-hazardous, non-radioactive. The unit is an excavated area between 183DR and 190DR. Approximately 25% of the bottom surface contains a layer of waste 1.5 to 3.0 meters (5 to 10 feet) deep that is covered with backfill.	Defer	0	Research and determine if "recent" disposal activities have occurred, is so volumes, period of time, etc. The site will not be included in work plan if active.

Table 4-2. 100-DR-2 Investigation (Sheet 3 of 3)

SITE	WASTE/TYPE	COMMENTS	STRATEGY	PROPOSED BOREHOLES	INVESTIGATION APPROACH
LOW PRIORITY FACILITIES					
1607-D-3 (Septic Tank and Associated Drain Field)	SEPTIC DRAIN	Site was started in 1944 and is currently active, receives sanitary waste from the 151-D electrical distribution substation. The flow rate of this unit is estimated at a maximum of 3,975 liters/day (1,050 gal/D).	Defer	0	No intrusive activities are planned, action is deferred pending resolution of common septic system approach.
118-DR-2 (105-DR Reactor Building)	105-DR REACTOR	Site was active from 10/3/50 through 12/30/64, contains an estimated 13,500 Ci of radionuclides, 85 metric tons (94 tons) of lead, 3 meters^3 (100 cubic feet) of asbestos and 500 lbs of Cadmium.	N/A	0	N/A
122-DR-1 (105-DR Sodium Fire Facility)	HAZARDOUS WASTE STORAGE	Site was active from 1972-1986, site wastes consist of Sodium, Lithium, and Sodium-Potassium Alloy. Approximately 20,000 Kg (44,092 lbs) are managed at this facility each year. The facility also stores up to 20,000 liters (5,283 gal) of dangerous wastes.	N/A	0	RCRA TSD facility, coordinate with closure Part A Permit, Part B Permit, interim closure plan has been submitted for this site.
132-DR-2 (116-DR Reactor Exhaust Stack)	EXHAUST STACK 61mX5m (200'X17')	The site was active from 1950-1986, waste is solid low-level waste. The unit is a monolithic, reinforced concrete structure with a maximum wall thickness of .46 meters (1.5 feet) at the base. An opening at the base provides access to its interior portion, this opening is fitted with a steel door.	N/A	0	N/A

Field Notes

Site Walk of the 100-Dr-2 Operable Unit

March 17, 1993, as amended 6/1/93

Attendees

DOE-RL	MACTC	ECOLOGY	WHC
Eric Goller	Robert Scheck	Ted Wooley	Naik Naiknimbalkar Alan D. Krug

The Site Walk of the 100-DR-2 Operable Unit was conducted on March 17, 1993. The waste sites visited during the site walk are described below. The minutes have been amended based on discussions held 6/1/93.

High Priority Sites:

116-D-8 100-D Cask Storage Pad

The site was active from 1946 through 1975. Not included in the TPA action plan.
The unit is a concrete pad with a drain. The drain facilitated pad decontamination and rain runoff. The drain discharged into the 105-DR process sewer.

This site contains trace amounts of radionuclides and decontamination chemicals. The pad contains a French drain. Location unknown. All casks have been removed, and an asphalt emulsion coating was placed on some areas of the concrete to fix all surface contamination.

No LFI activity is planned for this facility. Direct movement to IRM is recommended. Clean up could be adequately handled using the observational approach. Site to include adjacent site posted as underground rad. This may be location of contaminated concrete removed from pad.
Geophysics will be used to aid in location of French drain and evaluation of adjacent site.

116-DR-3 105-DR Storage Basin Trench. 60'x40'x10'

The site was active during 1955. The site is included in TPA action plan. The site received 4,000,000 liters of contaminated sludge and water removed from 105-DR Fuel Storage Basin.

Analogous with (DR-1) 116-D-1A & 116-D-1B.
LFI activities as follows:
1) Geophysics to locate the trench.
2) A single vadose zone borehole in a location to be defined by the geophysical survey.

116-DR-4	105-DR Pluto Crib 10'x10'x15' The site was active from 1952 to 1953. The site is included in the TPA action plan. The site received 4,000 liters of liquid wastes from isolated tubes containing ruptured fuel elements in the 105-DR Fuel Storage Basin.	Analogous with (DR-1) 116-D-2A Pluto Crib. No LFI planned. Geophysics will be used to confirm location.
116-DR-6	1608-DR Liquid Disposal Trench 50'x10'x10' The site was active from 1953 through 1965. The site is included in the TPA action plan. The site received 7,000,000 liters of diverted coolant during the Ball 3X upgrade. It also received diverted water during a reactor shutdown.	Analogous to 116-H-2. The location of the trench is questionable. LFI will be limited to researching the location of this trench.
116-DR-7	105-DR Inkwell Crib 5'x5'x10' The site was active during 1953. The site is included in TPA action plan. The site received 4,000 liters of liquid potassium borate from the 3X System prior to the Ball 3X System upgrade.	Borehole or test pit based on Access.
116-DR-8	117-DR-Crib 10'x10'x10' The site was active from 1960 through The site is included in the TPA action plan. The site received 240, 000 liters of drainage from the containment system 117 Building seal pits.	Analogous with 116-D-9. LFI activities will be limited to researching the wastes that may have entered the crib from 1964. Sodium Fire Facility operations.
132-DR-1	1608-DR Waste Water Pumping Station. 36'x34' The site was active from 1950 through 1964. The site is included in the TPA action plan. The waste is low level liquid waste. The unit consisted of: 1) an above ground structure consisting of concrete block walls,	Analogous with (DR-1) 132-D-3. No LFI planned.

a reinforced concrete floor, and a roof reinforced concrete deck with a composition surface; and 2) a below-grade structure of reinforced concrete. The facility contained an operating level, which consisted of pumping equipment, and an accumulation inlet chamber, which led three discharge sump chambers. The accumulation chamber was located in the northern section of the facility.

Sodium Dichromate Transfer Station

This site is located in the 100-DR 1 OU, but was not recognized during that investigation. The facility consists of a rail car pumping station, piping, and a tanker cleanout french drain.

LFI activities would consist of a vadose zone boring through french drain to ascertain the distribution and quantity of sodium dichromate in the vadose zone.

SOLID WASTE BURIAL GROUNDS

118-D-5 Ball 3X Burial Ground. Two trenches, 40'x20'x10' each

The site was active during 1954. The site is included in the TPA action plan. The site received 10 cubic meters of thimbles removed from the 105-DR Reactor during the Ball 3X work in 1954.

LFI will solely concentrate on confirming location and the configuration of the two burial areas.

126-DR-1 190-DR Clearwell Tank Pit 42'x525'(no depth listed)

The site has been active since 1970's as a landfill. The site is included in the TPA action plan. The waste is nonhazardous/nonradioactive. The unit is an excavated area between the 183-DR and 190-DR that contained four 3,750,000-gal steel water storage tanks. The four tanks were removed. Approximately 25% of the bottom surface area contains a layer of waste 5 to 10 ft. deep that is covered with pit run backfill and located in the

NO LFI planned.
Status will be reviewed in work plan.

northwest sector of the pit. The southern sector is posted as an asbestos area.

LOW PRIORITY SITES:

1607-D-3	1607-D3 Septic Tank and Associated Drain Field.	No LFI planned. Action deferred.

The site was started in 1944 and is active at present. The site is included in the TPA action plan. The site receives sanitary waste from the 151-D Electrical Distribution Substation. The flow rate to this unit is estimated at 1,050 gal/d.

Other Sites:

118-DR-2	105-DR Reactor Building	Not Applicable.

The site was active from October 3, 1950 through December 30, 1964. The site is not included in the TPA action plan. The site contains an estimated 13, 500 Ci of radionuclides, 94 tons of lead, 100 cu ft of asbestos and 500 lb of cadmium.

122-DR-1	105-DR Sodium Fire Facility	RCRA TSD Facility Coordinate with Closure. Part A Permit, Part B Permit, Interim Closure Plan has been submitted for this site.

The site was active from 1972 through 1986. The site is not included in the TPA action plan. The site wastes consist of sodium, lithium, and sodium-potassium alloy. Approximately 20,000 kg are managed at this facility each year. The facility also stores up to 20,000 L of dangerous wastes.

132-DR-2	116-DR Reactor Exhaust Stack 200'x16.58' diameter	Not Applicable

The site was active from 1950 through 1986.The site is not included in the TPA action plan. The waste is solid low level waste. The unit is monolithic, reinforced concrete structure with a maximum wall thickness of 1.5 ft. at the base. It rests on a double octagon shaped base that extends 17.5 ft. below grade. An opening at the base provides access to its interior portion. This opening is fitted with a steel door.

Other Discussions:

(1) During the site walk Eric Goller requested specific geophysical method(s) to be used in locating or confirming each waste site. Westinghouse promised to provide a table describing the geophysical methods to be used for each waste site. This table is attached.

(2) Ted Wooley made a comment that he would like to review the information provided to him during the site walk and get back to us after receiving the field notes of the site walk.

100-DR-2 OPERABLE UNIT
GEOPHYSICAL ACTIVITIES

SITE	OBJECTIVE	GEOPHYSICAL METHOD	LIKELIHOOD OF SUCCESS
116-D-8 (100-D CASK STORAGE PAD)	(1) TO LOCATE FRENCH DRAIN & (2) CHECK AREA OF UNDERGROUND CONTAMINATION	GPR/EMI	(1)POOR TO GOOD. GOOD, IF FRENCH DRAIN IS NOT UNDER SLAB. (2)BURIED DEBRIS LOCATION IS LIKELY.
116-DR-3 (105-DR STORAGE BASIN TRENCH) 60x40x10	(1) LOCATE BOUNDARIES (2) EVALUATE IF ADDITIONAL WASTE BURIED AT SITE	GPR/EMI	(1 & 2) FAIR TO GOOD, DEPENDING UPON OTHER SHALLOW DEBRIS & EXCAVATIONS IN THE AREA.
116-DR-4 (105-DR-PLUTO CRIB) 10x10x15	VERIFY LOCATION	GPR/EMI	GOOD, IF CRIB IS AN ISOLATED FEATURE. POOR TO FAIR IF THE CRIB IS WITHIN A 'LARGER' DISTURBED AREA.
116-DR-6 (1608-DR LIQUID DISPOSAL TRENCH) 50x10x10	(1) EVALUATE TWO POSSIBLE SITES (2) TRACE PIPELINE	GPR/EMI	(1)FAIR TO GOOD, DEPENDS UPON CONTRAST OF DISTURBED/UNDISTURBED GROUND. (2)GOOD FOR PIPE LOCATION
116-DR-7 (105-DR INKWELL CRIB) 5x5x10	VERIFY LOCATION	GPR/EMI	FAIR TO GOOD, DEPENDING UPON THE CONGESTION IN THE AREA.
116-DR-8 (117-DR CRIB) 10x10x10	(1) VERIFY (2) USE SITE AS A GEOPHYSICS TEST SITE	GPR/EMI	GOOD
132-DR-1 (1608-DR WASTE WATER PUMPING STATION) 36'x34'	LOCATE BOUNDARIES	GPR/EMI	GOOD, IF INTACT & COVERED SLAB STILL EXISTS.

118-D-5 (BALL 3X BURIAL GROUND, TWO TRENCHES) 40'x20'x10' each.	(1) LOCATE (2) EVALUATE 2 POSSIBLE CONFIGURATIONS	GPR/EMI	FAIR TO GOOD.
126-DR-1 (190-DR CLEARWELL TANK PIT) 42'x525'	NOT APPLICABLE		
1607-D-3 (1607-D3 SEPTIC TANK AND ASSOCIATED DRAIN FIELD)	VERIFY LOCATION OF (1) SEPTIC TANK (2) TILE FIELD	GPR/EMI	FAIR TO GOOD, DEPENDING UPON OTHER BURIED DEBRIS IN THE AREA, STEEL VS CLAY PIPE.
118-DR-2 (105-DR REACTOR BUILDING)	NOT APPLICABLE		
122-DR-1 (105-DR SODIUM FIRE FACILITY)	NOT APPLICABLE		
132-DR-2 (116-DR REACTOR EXHAUST STACK) 200'x16.58'.	NOT APPLICABLE		
SODIUM DICHROMATE TRANSFER STATION	LOCATE AND TRACE BURIED PIPES	GPR/EMI	GOOD FOR PIPE LOCATION

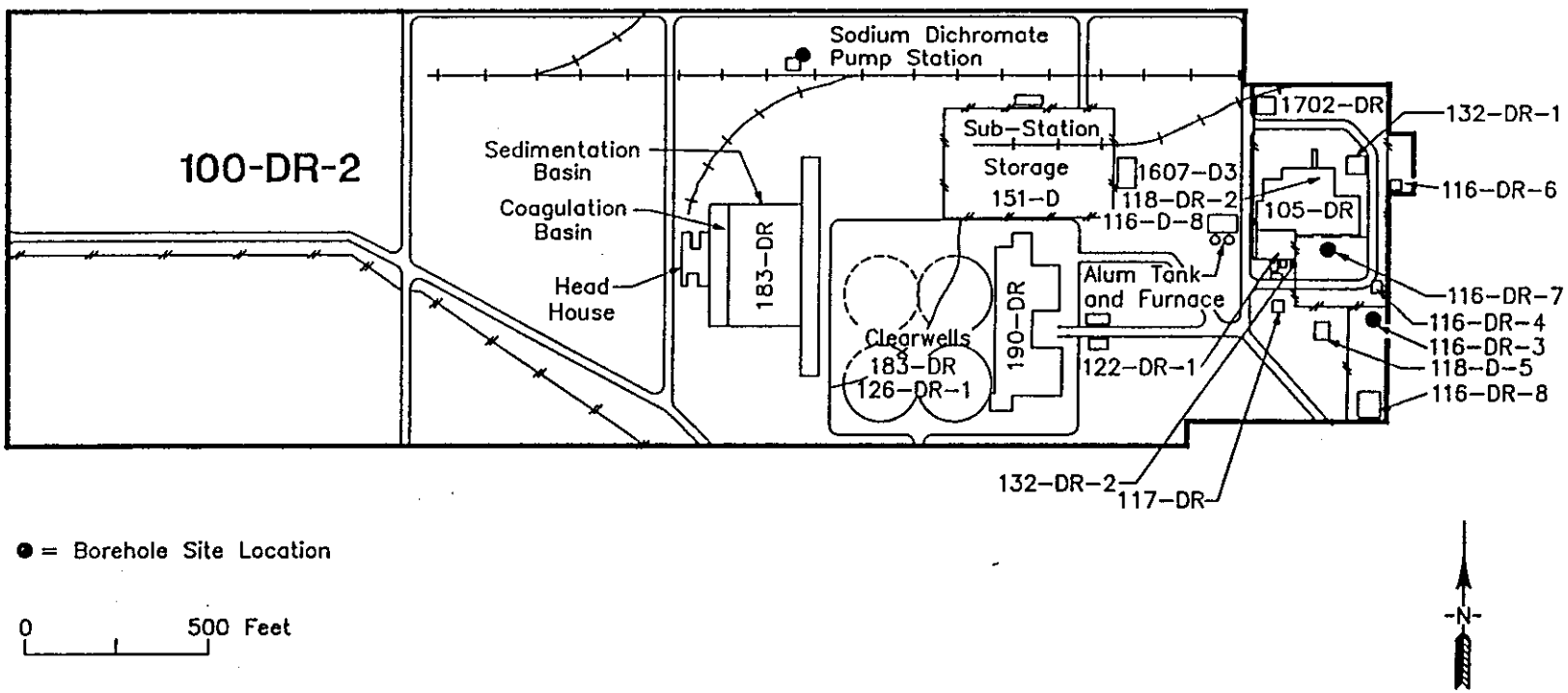


Figure 1. 100-DR-2 Borehole Sites

GEN\052093-A

Page 1 of 2

100 NPL Agreement/Change Control Form

Control Number		Date Submitted:
55	X Change X Agreement ___ Information Operable Unit(s) 100-DR-2	Date Approved: 06-24-93

Document Number & Title:	Date Document Last Issued:
Approval of Early Start of 100-DR-2 Intrusive Activities	NA

Originator:	Phone:
N.M. Naiknimbalkar	376-8739

Summary Description:

Total of three boreholes (one each for the three sites) are recommended to be drilled during the period from later part of July through the end of Fiscal Year 1993. The three sites are: 116-DR-3(105-DR Storage Basin Trench), 116-DR-7(105-DR Inkwell Crib) and Sodium Dichromate Transfer Station. The "Description of Work for 100-DR-2 Operable Unit Vadose Drilling" will be used to conduct these field activities. 100-DR-2 work plan is in progress and is based on 100-BC-2 work plan for format and content. 100-DR-1 work plan will be referenced for Health and Safety Plan.

This scope of work is based upon a draft work plan. If the scope is increased in the final work plan, this agreement will be modified to include that additional scope of work. A review will be conducted by DOE-RL, Ecology and EPA to assess the extent that the OU schedule can be accelerated to take advantage of the early start of work.

Justification and Impact of Change:

The agreement between DOE-RL and the Regulators for early start of Intrusive Activities at the 100-DR-2 Operable Unit will allow accelerated field activities to occur in support of streamlining the RI\FS process for the operable unit.

The agreement will have a positive impact in accomplishing work at this operable unit ahead of schedule. The agreement will also help in utilizing resources; available funding; equipment; and qualified drilling crew in a efficient and economic manner. Accomplishing this activity this year, will free up money during FY 1994.

Agreement on the start of intrusive activities, in advance of submitting the work plan is needed because this is an exception to the process described in Section 7.3 of the Tri-Party Agreement.

N.M. Naiknimbalkar 6/24/93
WHC Operable Unit Coordinator Date

Eric D. Goller 6/24/93
DOE Unit Manager Date

Ted Wooley 6/24/93
Lead Ecology Unit Manager Date

Paul Beaver 6/24/93
Lead EPA Unit Manager Date

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement
Section 9.3.

Distribution
Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 23, 1993

~~Roger D. Freeberg~~ /Julie K. Erickson /Eric Goller . . . . . DOE-RL, ERD (A5-19)
Mike Thompson . . . . . DOE-RL, EAP/RPB (A5-19)
Diane Clark . . . . . DOE-RL, TSD/SSB (A5-55)
Heather Trumble . . . . . DOE-RL, OTD/FTB (A5-19)
Steve Balone . . . . . DOE-HQ (EM-442)

Dennis Faulk . . . . . 100 Aggregate Area Manager, EPA (B5-01)
Ward Staubitz, USGS . . . . . Support to EPA
Audree DeAngeles, PRC . . . . . Support to EPA

Jack Donnelly . . . . . 100 Aggregate Area Manager, WDOE (Kennewick)
Larry Goldstein . . . . . WDOE (Lacey)

Lynn Albin . . . . . Washington Dept. of Health

Tom Wintczak, WHC . . . . . Program Manager (H6-27)
Mel Adams, WHC /A.D. Krug, WHC (H6-02) . . . . . (H6-01)
Bob Henckel, WHC . . . . . (H6-02)
L.D. Arnold, WHC . . . . . (B2-35)
Diana Sickle, WHC . . . . . (H6-27)
Chris Widrig, PNL (Please route to:) . . . . . (K1-21)
Wayne Martin, PNL . . . . . (K1-19)
Mark Hanson, PNL . . . . . (K1-51)
Roy Gephart, PNL . . . . . (K1-22)
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Joan Keller, PNL . . . . . (K1-21)
Ben Johnson, PNL . . . . . (K1-78)

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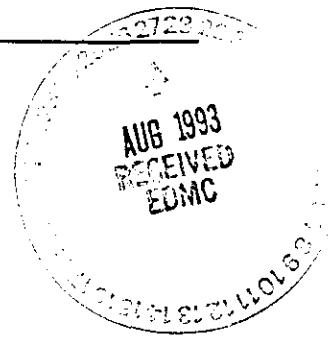

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